Haller + Erne GmbH

QTrans V2.0 User Manual

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1 About This Documentation

1.1 Content

This documentation describes the general function and operation of the QTrans software from the user's view. Here, the frequently used functions and operating steps are explained. The complete description of all user interface elements and more information on the functioning, installation and configuration are contained in the additional documentation.

This documentation is divided into the following chapters:

- Chapter 1: Information about This Documentation.
- Chapter 2: Overview of the QTrans System. Describes briefly how the system is set-up and which function it offers.
- Chapter 3: Installation. Contains important information on the system installation.
- Chapter 4: Introduction: Describes how the system functions, how data is transported through the system and provides background information on the understanding of the system processes.
- Chapter 5: Operation: Describes the system operation. Here, general user interface elements are explained, operating concepts are explained and processes for the implementation of frequently used functions are shown.
- Chapter 6: Configuration: Describes the system configuration. Here, all steps necessary for the configuration are explained using a complete system configuration as example.
- Chapter 7: Monitoring and Diagnosis: Shows which monitoring and diagnostic functions are available in QTrans.

1.2 Additional Documentation

Please also observe the current instructions of the Rexroth tightening system components and the following additional manuals and instructions for the QTrans software:

- QTrans V2.0 Quickstart: Examples of the commissioning of a data acquisition system with QTrans.
- QTrans V2.0 Installation and Administration: Documentation regarding the system installation and maintenance as well as information on safety and integration in the Windows operating system (for the system administrator) and other system environments (e. B. Siemens HMI).
- QTrans V2.0 Reference: Detailed documentation regarding the input masks, file formats and internal software processes.
- QTrans V2.0 Template Reference: Documentation regarding the customer-specific templates. Here, it is described how the process data is mapped to the customer-specific K fields and which additional functions and parameters are used.

Apart from that, short "Technical Notes" and "How-To“ instructions on special topics are available.

1.3 Terms and Abbreviations

1.3.1 Tightening System Terms

Docu step	Tightening step in which the data output function is activated. Normally, result data is only automatically generated for the chronologically last tightening step that has been tightened – if a step is marked as docu step, the data from the marked step is output as addition. Each docu step can be clearly allocated by means of a number; in the tightening system 350, up to 10 steps can be defined as docu steps (docu steps with number 1…10).
KE	Communication unit. It is used to control several control units and at the same time also to communicate with partner controllers.
Tightening application	Within one tightening application, 1 to n tightening positions are coordinated.
Tightening controller	As tightening controller is either a compact system or a modular system tightening controller with several tightening units.
Tightening channel	One tightening channel comprises the components necessary for a tightening. This includes the entire tightening spindle, the control, the servo amplifier and the connecting cable.
Tightening program	The tightening program coordinates the tightening process/tightening sequence. It is divided into different tightening steps in which the tightening parameters are determined.
Tightening position	The tightening position designates the defined location at which the tightening is realized by means of a tightening channel and a tightening program.
Tightening step	Smallest unit of a tightening program.
Tightening system	A tightening system is a complete system with all tightening channels that are required for tightening the defined tightening case.
Tightening cell	Tightening cell designates the installed hardware of at least one tightening channel and at least one data interface for communication with the operating program or with the partner controller. This includes the related tightening programs and tightening applications.
SE	Control unit. Compact systems consist of one single control unit each.
Control	Controls are: Tightening controller (SE or compact system) Communication unit (KE)
Stitching	Designates the process in which several tightening positions at one component are tightened one after another by means of a tightening spindle (or a group of tightening spindles) by mechanical displacement of the tightening spindle(s) or the component.
Monitoring function	During the tightening process, a monitoring function observes compliance with upper and lower limit values by controlling a monitoring parameter (e.g. gradient). If the monitoring function is switching, non-compliance with the limit values will result in the immediate termination of the tightening step. If it is not switching, it sets the step result to NOK even if the target parameter has been achieved.
Monitoring parameter	The monitoring parameter is the measurand (e. g. gradient) of a tightening step, which has to be kept within certain limits in order to guarantee safe completion of the tightening process. Violation of the limits might result in the termination of the tightening step.

Target function By monitoring the target parameter (e. g. torque), the target function controls the process run of a tightening step and leads to the completion of the step if the parameter reaches its target value.

Target parameter The target parameter is the measurand (e. g. torque) of a tightening step, which - for the successful completion of a tightening process - has to achieve a certain value (target value). Achievement of the target value results in the termination of the tightening step.

Additional parameters Additional parameters are parameters of a tightening step that influence the tightening process (e. g. command speed, torque threshold), can, however, not interrupt the tightening process.

1.3.2 Terms Regarding the Quality, Q-Das, qs-Stat and the Software

AQDEF Automotive quality data exchange format. A data form defined by a work group with participants from the automobile industry and the Q-Das company. The goal is a standardized data exchange format for automotive quality data allowing for the processing of manufacturer- and customer-independent quality data by means of the Q-Das software products. In this connection, binding specifications for the data acquisition and the data transfer have been defined.
The data format is based on the Q-Das ASCII transfer format; the AQDEF specification moreover defines which data has to be supplied for certain applications (mandatory) and which is optional. Apart from that, applications, boundary conditions for the software application and its operation are defined.
A certification ensures that the requirements have been met completely.

dfd, dfx and dfq Standard file name extensions for the quality file formats that have been defined by Q-Das. Apart from descriptive information, they contain changeable values (dfx), parameter values (dfd) or both (dfq).

Catalog In Q-Das qs-Stat, only pre-defined values can be used for some K fields. The admissible values are specified and/or maintained in a file (in the DFD file format) that in addition to the actual value contains a key value and a description (optional). Only the key values will then be saved in the Q-Das data (as numerical value); applications will show the user the value and/or the description (also localized according to the local language, if applicable).

K field The K field is the basic element in the AQDEF data exchange format. All characteristics are defined via K fields and the characteristic values are allocated to K fields. Apart from the characteristic values, additional information is stored in K fields (e. g. measuring point, organizational data, ...). Finally, there is one column in the quality database behind each K field.

Characteristic In statistics, a characteristic is generally described by a feature or a status of an examined object, which can be used for differentiation or evaluation purposes. In technology, you distinguish between variable (changeable, usually physical measurement values) and attributive (discrete statuses, e.g. red/green/yellow). In the tightening technology quality evaluations, the individual measurement values are used as characteristics, i.e. there are characteristics for torque, angle, time, etc.

Characteristic type Is used in the context of Q-Das for the measurement type (with variable characteristics), i.e. for example torque or angle.

Characteristic See characteristic value

value	
Characteristic ident	Clear identifier for a characteristic. Is used in order to allow for clear assignment of the characteristic values in the quality database.
Characteristic class	Is used in the context of Q-Das for differentiating the relevance of the characteristics: depending on the characteristic class, a characteristic is a quality characteristic or not (secondary characteristic). In the tightening technology, it is here, particularly with special tightening processes, distinguished between the controlled/guided and the free (measured/monitored) value (e. g. tightening torque: torque controlled, angle monitored → torque is no statistically relevant measurement value).
Characteristic value	Value for a characteristic, usually a measurement value (for variable characteristics).
Quality characteristic	A characteristic that is decisive for the quality.
Q-Das	Company supplying software for the statistical examination of production processes.
qs-Stat	Q-Das software package for the statistical evaluation of process data.
Script, scripting	In the software technology, these terms designate an instruction sequence in a programming language that is especially used for application extensions in order to realize additional processing or adjustment to special requirements in a flexible form. The instruction sequence is usually saved as text and only interpreted and executed when it is needed. In QTrans, this is used for the realization of customer-specific requirements without the need of adjusting the software core.
Part	An object produced in a production system (component, workpiece) is referred to as part. The part can usually be clearly identified by means of a part ident.
Part ident	Any number or text, which clearly identifies a part. Examples include chassis numbers, component serial numbers, or the like.
Part type	A part type describes a class of parts with common properties. Different variants are defined by means of different part types (e. g. 4-cylinder motor and 5-cylinder motor).
Template	Template file used by QTrans for the customer-specific adjustment of the Q-Das data output depending on the application. Contains script instructions for the assignment between process values and configuration data and the K fields. Moreover allows for the definition of parameter values for the GUI, the use of catalogs and customer-specific formatting or conversions of K field values.

2 Overview of QTrans

This section gives a short overview of the QTrans functions and shows how the software can be used. The operation and installation of the software as well more general information on the software are described as of chapter 3.

2.1 System Overview

It is the basic function of the QTrans software to accept tightening results data from the Rexroth 300/310/350 tightening systems, to convert it into the Q-Das AQDEF file format and forward it for further analyses, storage and archiving. Apart from that, the software offers user guidance for the control of nutrunners and measurement systems in order to perform MCS and measurement system analyses. This allows for the completion of type 1 and type 1A measurement system analyses without reconfiguration of the tightening controller.

The following illustration shows the basic overview of the QTrans software use:

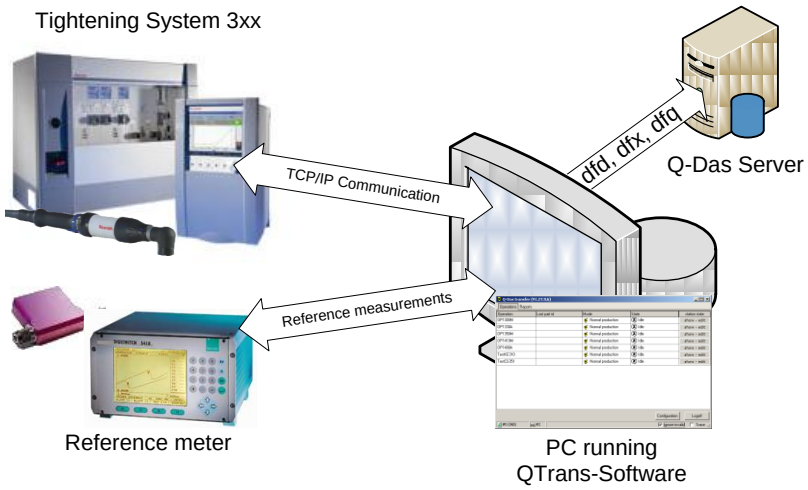


Figure 2-1 Use of the QTrans software

2.2 Components and Applications

The QTrans software consists of the following components:

- QTrans: central data conversion component. Can be used as Windows system service (then without GUI), independently as desktop application or also as report viewer client in the network. The report functions show currently incoming tightening results and allow for the creation of simple statistical reports. The support for capability studies offers functions for the remote control of tightening systems for measurement system analyses (with worker guide and automatic measurement value storage for reference measurement systems) as well as commissioning and process capability studies.
- DBEdit: Component for the system configuration. Offers graphical editors for the tightening position assignment and K field processing as well as functions for the transfer of the configuration directly from the tightening system.
- QBackup: Component for the reliable and automatic loading of the quality datasets to the Q-Das server ("push" model).

Depending on the purpose, these components may be jointly installed on one computer (for a small system) or also in a distributed form in the network. The following figure shows an example of a distributed use with central server in the computer center, report viewers at the line, configuration using a computer in the planning department and MCS/capability studies by means of a laptop:

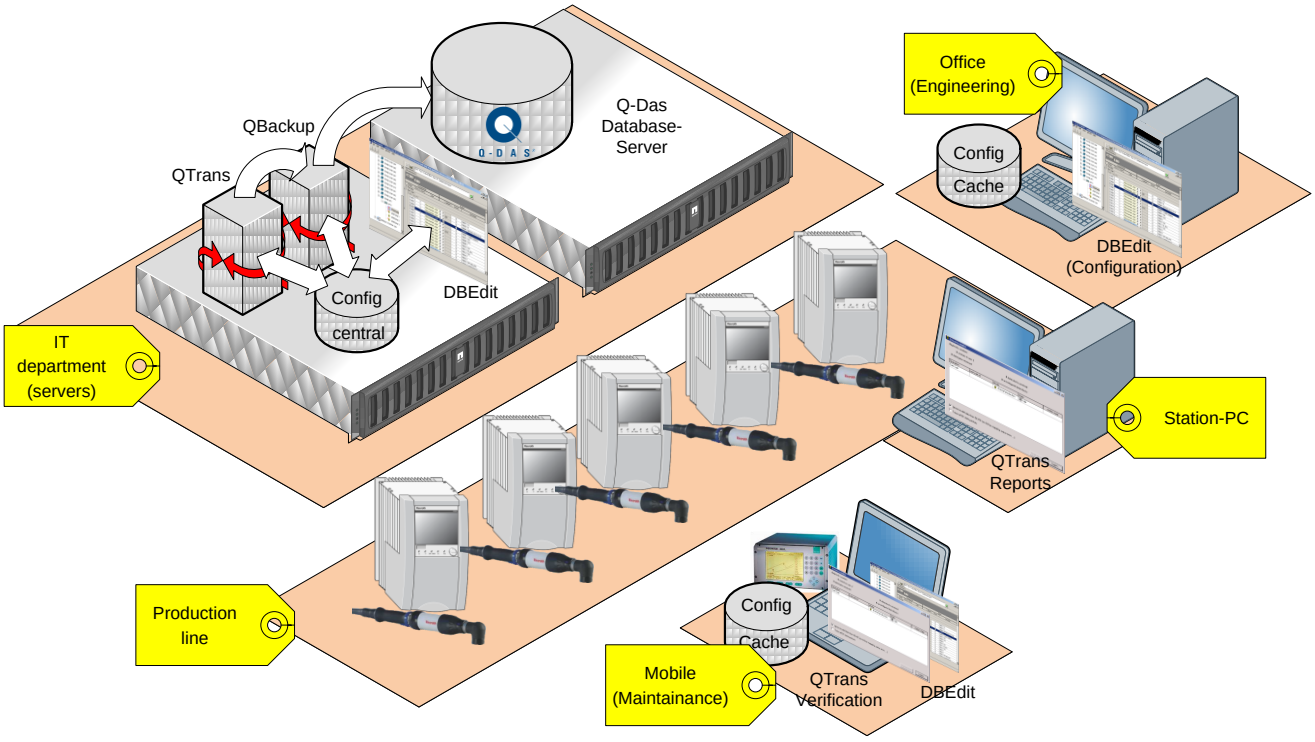


Figure 2-2 Distributed QTrans installation in the network

2.3 Reports

The QTrans software offers report functions for the simple diagnosis and analysis directly on the production level. They do not contain high-end statistics functions like the Q-Das qs-Stat software, but rather offer easy-to-use analyses providing a quick overview of the latest components produced (adjustable, e.g. the last 10000 rundowns).

The following reports are available:

- Dynamic report: This report shows all new tightening results directly and in real-time, as received from the tightening system. The OK/NOK results are optically highlighted by means of color codes and information regarding configuration problems is displayed. Flexible filter and sorting options allow for the easy tracking of individual nutrunners, components or stations. Using the dynamic reports, more reports (see below) can be generated in order to further analyze the data ("drill-down").
- End of cycle report: This report shows a station- and part-based view of the tightening results data. Here, the result values are shown in a table so that the individual tightening positions are arranged horizontally next to each other and the columns with the results of one tightening position can be easily compared with each other. Here, the "first time quality" percentages of the tightening positions are also calculated and displayed.
- Reject report: Similar to the end of cycle report; however, the reject report shows the components with NOK tightening and the related reasons.
- Root cause analysis: This report shows a summarized listing of the NOK tightenings and sorts and/or groups them according to the NOK reason. The presentation can be displayed from the point of view

of the tightening step, the program, the tightening application or the station so that you can easily get an overview of the selected group or compare them with each other (e. g. which station produces most NOKs?). The individual entries will then show the number of NOK tightenings per tightening step, tightening program, tightening spindle, etc. so that extraordinary deviations (e. g. spindle positioning errors, frequent cancelations in a certain tightening step) can be identified and optimized and/or removed.

- FTQ report ("first time quality"): This report provides a fast overview of the OK/NOK figures of tightening cells, spindles and tightening applications: This gives you a fast overview of where the most frequent problems occur and the possibility to give their removal top priority.

All reports offer the possibility of interactive filtering, sorting and grouping so that the desired information can be presented in perfect form. In addition, the displaced data can be exported (as Excel or XML) or printed for further processing.

2.4 Capability Studies

Apart from the standard operating mode for converting and saving the result datasets for transfer to the Q-Das server, QTrans supports the generation of datasets for capability studies for evaluating the capability of measurement systems, machines and processes.

For carrying out measurement system analyses, QTrans offers special functions leading the operator through the process in an interactive form and allowing for the remote control of the tightening system to be examined from the QTrans software. This also allows operators without knowledge of the tightening system programming and parameterization to carry out correct measurement system analyses.

After selection of a measurement system analyses by the user, parameters for the measurement series will be queried; then, the nutrunner will be started according to the number of specified measurement cycles and the measurement values are read in by the nutrunner (and the reference measurement system, if applicable). After completion of the measurements, the results are saved in the Q-Das format.

In the measurement system analyses, the following types are supported:

- Type 1: Examination of the nutrunner by means of a specified reference part (that is usually a calibrated torque measuring device creating a given reference torque/angle profile). Here, the measured torque and angle values notified by the nutrunner are compared with fixedly determined reference values.
- Type 1A: Examination of the nutrunner by means of a reference measurement system. Here, a calibrated reference measuring encoder is mounted at the nutrunner output drive; this encoder provides comparative values for the measured torque and angle values notified by the nutrunner.

2.5 New and Changed Functions in QTrans V2.0

As compared to the previous versions (V1.27), the QTrans version 2.0 offers the following new or changed functions:

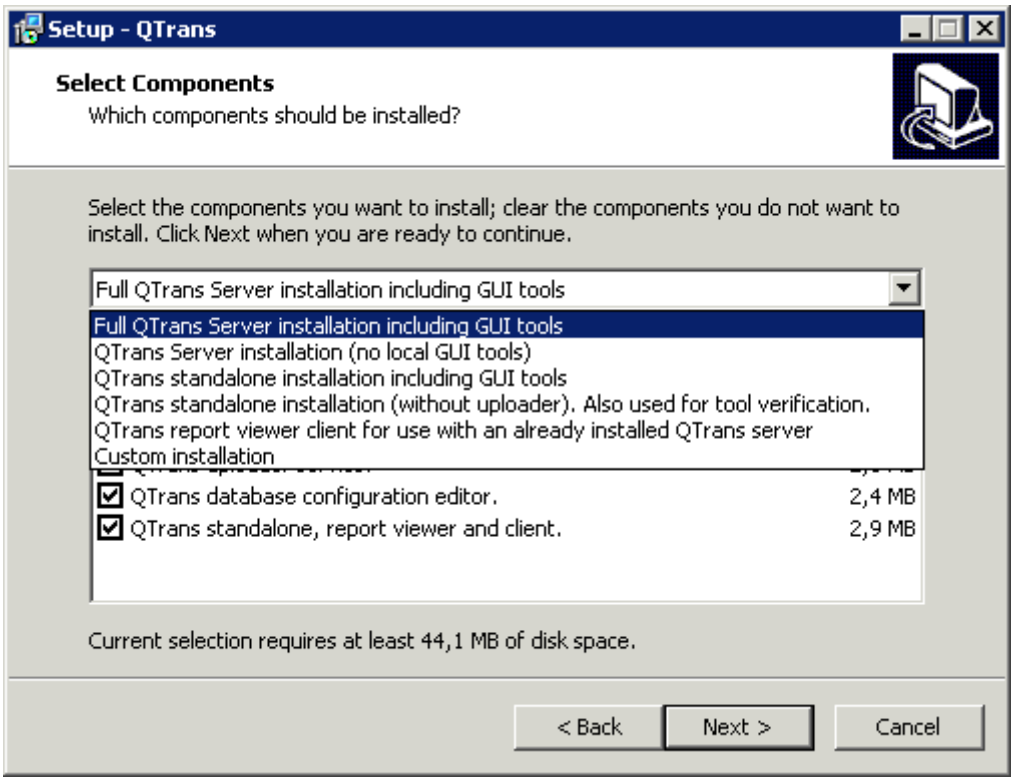
- Support of the AQDEF format and certification according to AQDEF category C:
    - Guaranteed compatibility of the data interface and conformity of the user interface by certification according to AQDEF standard V3.0 category C for tightening systems.

  - Support for the dfd/dfx and dfq file formats as well as all writing modes according to AQDEF standard.
  - Support of catalogs
  - Flexible configuration and assignment of the K fields: K fields can be activated/deactivated, new K fields can be added and process values can be freely allocated to K fields (direct assignments or flexible expressions with formatting and scripting).
  - Minimization of the "double" configuration: Any information that is stored in the tightening controller (spindle names and names of tightening positions, program parameters) can be directly accepted by the tightening system. In the software, only the assignment of the tightening positions and moreover Q-Das-specific parameters, if necessary, are stored.
- Full support for the tightening system generation 350 with firmware V2.200:
  - Support for up to 10 docu steps and 100 tightening programs per channel, full support of the new data formats (step category, program names, modification date, ...)
  - Remote control of the tightening system (spindle start and program selection) for measurement system analyses without manual reconfiguration of the tightening system via serial, USB or Ethernet.
  - Read-in of the nutrunner configuration and programs directly from SE/CS/KE, no manual configuration of tightening programs and tightening steps necessary any more – with support for the tracking of changes in the tightening programs!
- Support for one "virtual" tightening step per tightening position: In this way, a standard-conform and complete data recording of the tightening results can be achieved despite limitations of the Q-Das data format also for the NOK case.
- Support for desktop and server operation: QTrans can work as system service without registration; configuration, monitoring and reports can be carried out remotely, via the network.
- Performance optimization for dynamic reports and the data conversion as well as considerably improved performance for the integrated FTP server.
- Optimization of the configuration workflow: For the basic function, only the nutrunner configuration has to be read in and the tightening position assignment has to be defined.
- New K field editor: More flexibility (definition of K field values not only possible on part and characteristic level but moreover on line, station and tightening position level), easier operation (K fields and description are displayed, catalogs are supported) and integrated diagnosis tools (process data can be simulated directly from the K field editor and the generated Q-Das files can be examined).
- Support for new reference measurement systems: Schatz Inspect+
- Improved support for tightening position and part type assignment via the ID code (for stitching) - with GUI for the assignment between ID code and the corresponding masks.
- Scripting in many parts of the application for flexible adjustments.
- Improved behavior for quitting/restarting the applications – station status and datasets can now be maintained also after a restart without being completed (configuration changes can now be implemented immediately without waiting for a break).
- New system service for automatic data upload to the quality data server (push).

3 Installation

3.1 Installation

The software installation is started by calling the setup.exe installation program. After the call-up, the installation program will lead you through the installation step by step. In the "Select components" step (see screenshot below), it should be made sure that the correct installation version is selected:


Setup - QTrans
Select Components
Which components should be installed?
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.
Full QTrans Server installation including GUI tools
Full QTrans Server installation including GUI tools
QTrans Server installation (no local GUI tools)
QTrans standalone installation including GUI tools
QTrans standalone installation (without uploader). Also used for tool verification.
QTrans report viewer client for use with an already installed QTrans server
Custom installation
QTrans database configuration editor. 2,4 MB
QTrans standalone, report viewer and client. 2,9 MB
Current selection requires at least 44,1 MB of disk space.
< Back
Next >
Cancel

Generally, the following selection options are available:

1. Server installation: Installs the QTrans server version as Windows system service. Depending on the selection (with or without additional GUI software), additional configuration software and the report viewer (automatically configured for a local connection to the server) are installed. In this configuration, no MCS and measurement system analyses are possible without additional manual interventions.
2. Desktop installation: Installs the QTrans software as Windows application with GUI for the local data acquisition and conversion. In this connection, all QTrans software functions (including MCS and measurement system analyses) are available for operation with one single computer. Depending on the selection, the software for the automatic upload of the Q-Das datasets to the server ("push") will be installed automatically.
3. Report viewer client: Installs a viewer for the (read-only) access to an already existing QTrans server installation. This allows (e.g. on a computer close to the production system) to access the data of the server (that is e.g. located in the computer center) and to use the QTrans reports.

Note: For the installation with the Siemens HMI, option "2" should be selected as the software is then started together with the HMI. For MCS/measurement system analyses, you can then create a shortcut according to the description in the "QTrans V2.0 Installation and Administration" manual.

Note: For more details regarding the installation and set-up of the QTrans software for different applications, please refer to the "QTrans V2.0 Installation and Administration" manual.

3.2 Software Activation

Use of the QTrans software requires an activation for the release of all functions. After the installation, the software is by default in the demo mode; in this mode, the use of the software is limited.

There are two options to release (activate) the software:

- Requesting an activation key for test purposes: By selecting this option, an activation key is requested. After entry of the returned activation key in the activation dialog, all software functions will be released for a test period (30 days). During the test period, the software will display a reference to the test operation during start-up specifying the remaining test period. After expiry of the test period, the software will change back to the limited demo mode.
- Requesting an activation key for buying the software license: By selecting this option, an activation key is requested. In this case, data on the licensee, the computer name and the software serial number are transmitted (by email or fax). After entry of the returned activation key, the software functions will be released according to the license and the registration dialogs upon software start-up will be deactivated.

If the software has been acquired as physical delivery (a CD), the software serial number that is necessary for the activation is contained in the CD case and/or on the CD labeling. If the software has been downloaded, the serial number can be requested on the telephone or by fax/email.

Note: The software activation binds the software license and the software serial number to the computer name. An activation key is only valid for one computer. When exchanging a computer (e.g. in case of a computer failure), the software can still be used as long as the computer name is taken over without changes (as e.g. with an image backup/restore). For more related information, please refer to the "QTrans V2.0 Installation and Administration" manual.

4 Introduction

4.1 Overview

The following illustration shows an overview of the QTrans software. The QTrans software consists of several software components (DBEdit for configuration, QTrans for data conversion, for reporting and capability study as well as QBackup for data transfer via the network). The following figure shows the interaction of the components:

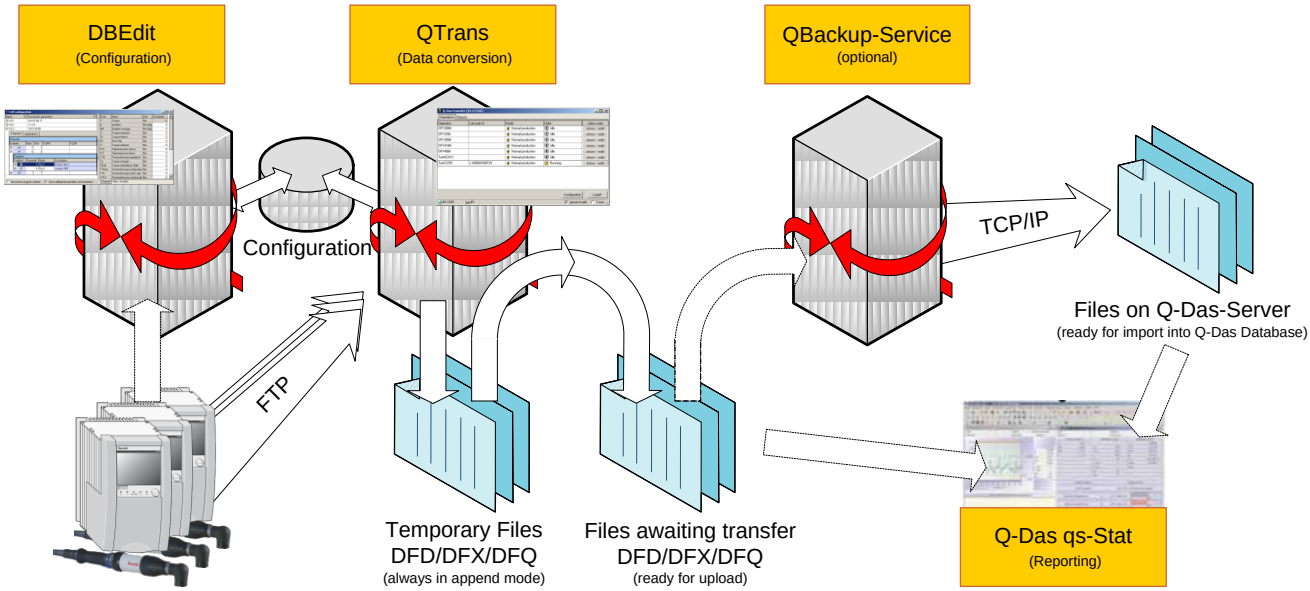


Figure 4-1 QTrans system overview

The tightening results data is basically sent from the tightening system to the QTrans software via the FTP network protocol. QTrans contains an FTP server accepting these results and converting them into Q-Das-compatible files according to the configuration specifications. In this connection, the individual tightening results are then allocated to tightening positions so that subsequent analyses allow for clear reference to the component. The generated files are temporarily buffered for a specified time or number so that several datasets can be collected in one file. After a complete file has been created, it is copied into a transfer directory so that it can then be transmitted to the server via the network (optionally via the QBackup service) or directly read in and processed by means of qs-Stat.

For the configuration, the DBEdit software component is used. It offers graphical editors for processing the configuration database. Here, especially the definition of lines and stations as well as the assignment between the nutrunner hardware and the logic line structure as well as the definition of part types and the assignment of the tightening positions are made possible. For special requirements and additional parameters, a K field editor is provided by means of which the data output can be adjusted up to the K field level.

4.2 Line Structure and Tightening Position Assignment

For creating the Q-Das quality data, the QTrans software must map process data (tightening results) that is received from the tightening controllers into the Q-Das data model. In this connection, the data contained in the tightening results dataset (like TCP/IP address of the control, tightening channel number, tightening

program and/or tightening application number) must be allocated to the logic structure line, station, part (and/or part type) and tightening position expected by Q-Das.

The following figure shows the terminology and the basic assignment between the tightening technology and the line structure:

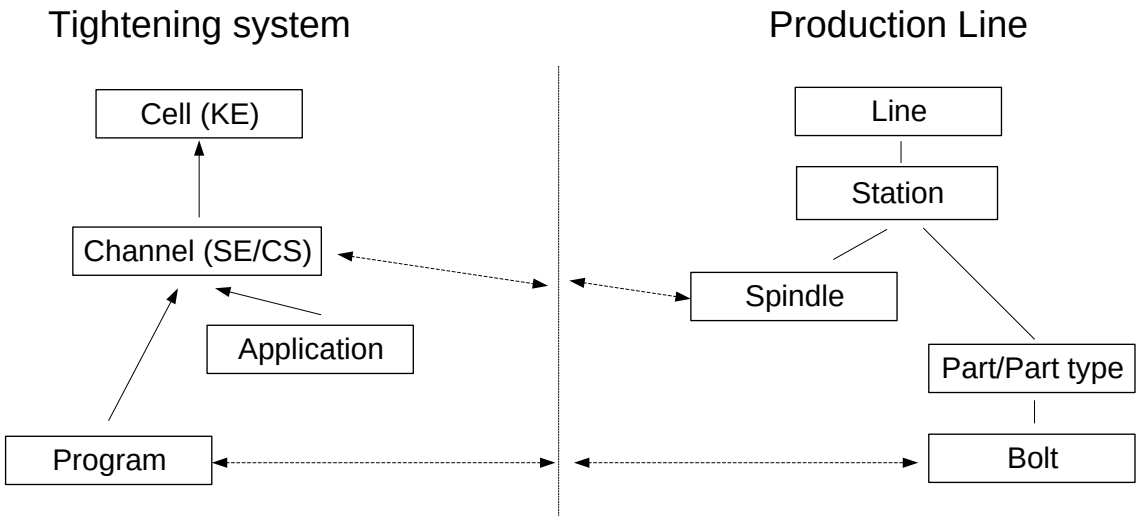
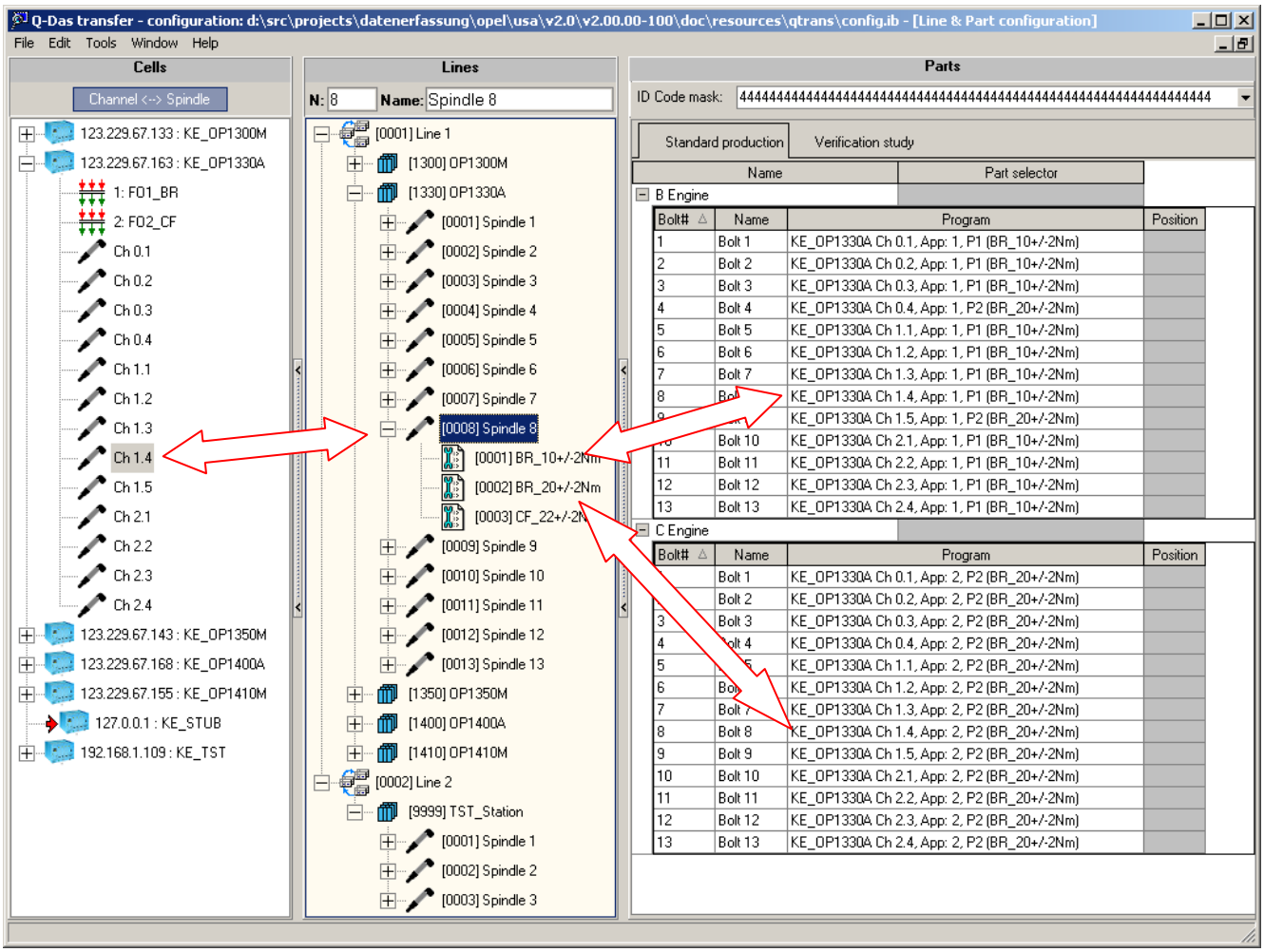


Figure 4-2 Assignment between tightening technology and line structure

Here, the following special facts have to be considered:

- Between the tightening channel of a tightening cell and the tightening spindle of a station, there is always a one-to-one assignment. The designation and/or numbering of the tightening spindles is, however, often different from the tightening channel numbering. A tightening channel is defined via the slot and thus has an implicit numbering (rack and slot, e.g. Ch 0.1) whereas the spindles are often numbered according to the station (station 1 spindle 1...n, station 2 spindle 1...m).
- Between tightening cell and station, there is generally no clear assignment. There may be several tightening cells in one station (e.g. one KE350 for the nutrunners of the left side and one KE350 for the right side) and also one tightening cell controlling several nutrunners (e.g. one joint KE for the nutrunners of the automatic and the reworking station).
- If several tightening positions of one component are tightened with one nutrunner (e.g. by displacement ("stitching")), there may possibly no longer be a 1:1 assignment between tightening program and tightening position.

The following screenshot shows how the assignment has been implemented in the QTrans configuration (in the DBEdit configuration editor). Here, the assignments between tightening channel and tightening spindle as well as between tightening program or tightening application and tightening position can be established by means of drag&drop.


Q-Das transfer - configuration: d:\src\projects\datenerfassung\opel\usa\v2.0\v2.00.00-100\doc\resources\qtrans\config.ib - [Line & Part configuration]
File Edit Tools Window Help
Cells
Channel <--> Spindle
123.229.67.133 : KE_OP1300M
123.229.67.163 : KE_OP1330A
1: FO1_BR
2: FO2_CF
Ch 0.1
Ch 0.2
Ch 0.3
Ch 0.4
Ch 1.1
Ch 1.2
Ch 1.3
Ch 1.4
Ch 1.5
Ch 2.1
Ch 2.2
Ch 2.3
Ch 2.4
123.229.67.143 : KE_OP1350M
123.229.67.168 : KE_OP1400A
123.229.67.155 : KE_OP1410M
127.0.0.1 : KE_STUB
192.168.1.109 : KE_TST
Lines
N: 8 Name: Spindle 8
[0001] Line 1
[1300] OP1300M
[1330] OP1330A
[0001] Spindle 1
[0002] Spindle 2
[0003] Spindle 3
[0004] Spindle 4
[0005] Spindle 5
[0006] Spindle 6
[0007] Spindle 7
[0008] Spindle 8
[0001] BR_10+/-2Nm
[0002] BR_20+/-2Nm
[0003] CF_22+/-2N
[0009] Spindle 9
[0010] Spindle 10
[0011] Spindle 11
[0012] Spindle 12
[0013] Spindle 13
[1350] OP1350M
[1400] OP1400A
[1410] OP1410M
[0002] Line 2
[9999] TST_Station
[0001] Spindle 1
[0002] Spindle 2
[0003] Spindle 3
Parts
ID Code mask:
Standard production
Verification study
Name
Part selector
B Engine
Bolt# Name Program Position
1 Bolt 1 KE_OP1330A Ch 0.1, App: 1, P1 (BR_10+/-2Nm)
2 Bolt 2 KE_OP1330A Ch 0.2, App: 1, P1 (BR_10+/-2Nm)
3 Bolt 3 KE_OP1330A Ch 0.3, App: 1, P1 (BR_10+/-2Nm)
4 Bolt 4 KE_OP1330A Ch 0.4, App: 1, P2 (BR_20+/-2Nm)
5 Bolt 5 KE_OP1330A Ch 1.1, App: 1, P1 (BR_10+/-2Nm)
6 Bolt 6 KE_OP1330A Ch 1.2, App: 1, P1 (BR_10+/-2Nm)
7 Bolt 7 KE_OP1330A Ch 1.3, App: 1, P1 (BR_10+/-2Nm)
8 KE_OP1330A Ch 1.4, App: 1, P1 (BR_10+/-2Nm)
KE_OP1330A Ch 1.5, App: 1, P2 (BR_20+/-2Nm)
Bolt 10 KE_OP1330A Ch 2.1, App: 1, P1 (BR_10+/-2Nm)
11 Bolt 11 KE_OP1330A Ch 2.2, App: 1, P1 (BR_10+/-2Nm)
12 Bolt 12 KE_OP1330A Ch 2.3, App: 1, P1 (BR_10+/-2Nm)
13 Bolt 13 KE_OP1330A Ch 2.4, App: 1, P1 (BR_10+/-2Nm)
C Engine
Bolt# Name Program Position
Bolt 1 KE_OP1330A Ch 0.1, App: 2, P2 (BR_20+/-2Nm)
Bolt 2 KE_OP1330A Ch 0.2, App: 2, P2 (BR_20+/-2Nm)
3 Bolt 3 KE_OP1330A Ch 0.3, App: 2, P2 (BR_20+/-2Nm)
4 olt 4 KE_OP1330A Ch 0.4, App: 2, P2 (BR_20+/-2Nm)
5 KE_OP1330A Ch 1.1, App: 2, P2 (BR_20+/-2Nm)
6 Bo KE_OP1330A Ch 1.2, App: 2, P2 (BR_20+/-2Nm)
7 Bolt KE_OP1330A Ch 1.3, App: 2, P2 (BR_20+/-2Nm)
8 Bolt 8 KE_OP1330A Ch 1.4, App: 2, P2 (BR_20+/-2Nm)
9 Bolt 9 KE_OP1330A Ch 1.5, App: 2, P2 (BR_20+/-2Nm)
10 Bolt 10 KE_OP1330A Ch 2.1, App: 2, P2 (BR_20+/-2Nm)
11 Bolt 11 KE_OP1330A Ch 2.2, App: 2, P2 (BR_20+/-2Nm)
12 Bolt 12 KE_OP1330A Ch 2.3, App: 2, P2 (BR_20+/-2Nm)
13 Bolt 13 KE_OP1330A Ch 2.4, App: 2, P2 (BR_20+/-2Nm)

You can also see from the screenshot that part types are allocated to a station. In the context of Q-Das, a part type always describes a processing version in a station.

In practice, it is particularly the assignment of the tightening results to the correct tightening positions, which is not always easy. Based on the individual tightening result, QTrans must recognize the component type and the corresponding tightening position and select them for saving the data. In this connection, the following problems occur:

- Ambiguity of the tightening position definition: As already one single tightening result must be enough for the selection of the tightening position and the part type (if e.g. in case of NOK only one tightening position is actually tightened), the received data of one single tightening result must allow for clear assignment.
- Offline data: As in case of communication failures, datasets are saved in the tightening controller and tracked subsequently, external signals (e.g. digital I/O or other signals transmitted in real-time (field bus systems or OPC, etc.)) cannot be used in order to provide for unambiguity.

For these reasons, only information that is contained in the tightening results datasets is used for the tightening position assignment. The following parameters are used:

- TCP/IP address and channel number: tightening cell and tightening channel assignment to station and spindle. In the configuration, the corresponding spindle (and thus also the station) is stored for each tightening cell and each tightening channel.

- Tightening program number and tightening application number. Both values together are used as primary information for selecting a part type and for the assignment of a tightening position. As the tightening system allows you to start the same tightening programs via different tightening applications, the application number can, for example, be used as additional type selection information or position information.
- ID code: From the ID code, additional information on the tightening position and/or on the part type selection can be seen. In this connection, the parameters that are stored in the part and/or tightening position configuration are then compared with an extract form the ID code. In case of compliance, the corresponding part type or the tightening position will then be selected.

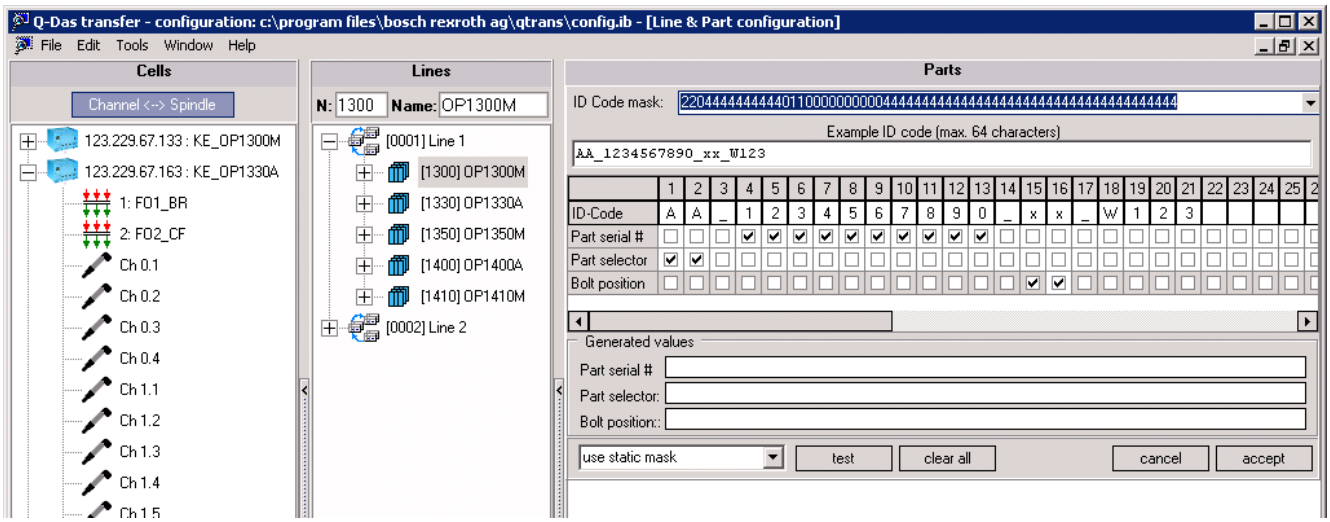


Figure 4-3 Editor for ID code masking

Note: The ID code masking also defines which parts of the ID code are to be used as actual, clear part ident – this is used for the control of the parts supply and discharge (see chapter 4.4).

QTrans offers two diagnosis functions in case of problems with the parts type or tightening position assignment:

- During the configuration: Here, a consistency check between the defined part type and tightening position mask and the specification for a component is carried out. Deviations are marked in red in the parts editor (see also screenshot at the top). Entries that could lead to an ambiguity of part type or tightening position are generally rejected.
- During the runtime: QTrans shows in the dynamic report whether successful assignment to component type or tightening position has been possible for a tightening result – if this is not the case, corresponding information will be shown.

4.3 Parameter Setting

Apart from the tightening result assignment to parts and tightening positions (see above), additional information is required for the generation of standard-conform Q-Das datasets. In QTrans, this information is taken over from two different areas:

- Information from the tightening system. This is the preferred area – takeover of information that has already been stored in the tightening system ensures that there is no incorrect information due to "double" configuration at different locations, which has to be updated requiring a great amount of work.

- Additional information. So that QTrans is able to cover flexible requirements of different customers and applications, additional information can be inserted manually. This information can be entered in the K field editor on different levels (line, station, spindle, part, tightening position or characteristic), calculated dynamically (via scripts) or also be selected by means of the template from numerous predefined "variable" and filled with values.

4.3.1 Takeover from the Tightening System

For the takeover of information from the tightening system, QTrans uses two different mechanisms: For the basic configuration in the DBEdit configuration editor, the tightening controller memory can be read out and information on the tightening channels, tightening applications and tightening programs configured there can be extracted. During runtime, the corresponding information is extracted from the FTP tightening results datasets and automatically updated. Here, the advantage is that no "learning" is necessary for the system configuration; any required data can be taken over by the tightening system. Subsequent changes are then automatically updated via the data output.

In the read-out of the tightening controller memory, the DBEdit configuration editor allows for the automatic takeover of all information from the nutrunner and a comparison and the synchronization of changes, if necessary. This can be used for the verification (e.g. with incorrectly configured tightening programs) or also for updating changes that are not updated automatically (e.g. the addition of a new tightening spindle). The only information that the user has to enter for the data takeover from the nutrunner is the tightening system's IP address, i.e. the one-time creation of the tightening cell in the system. The following screenshot shows an example of the data takeover.

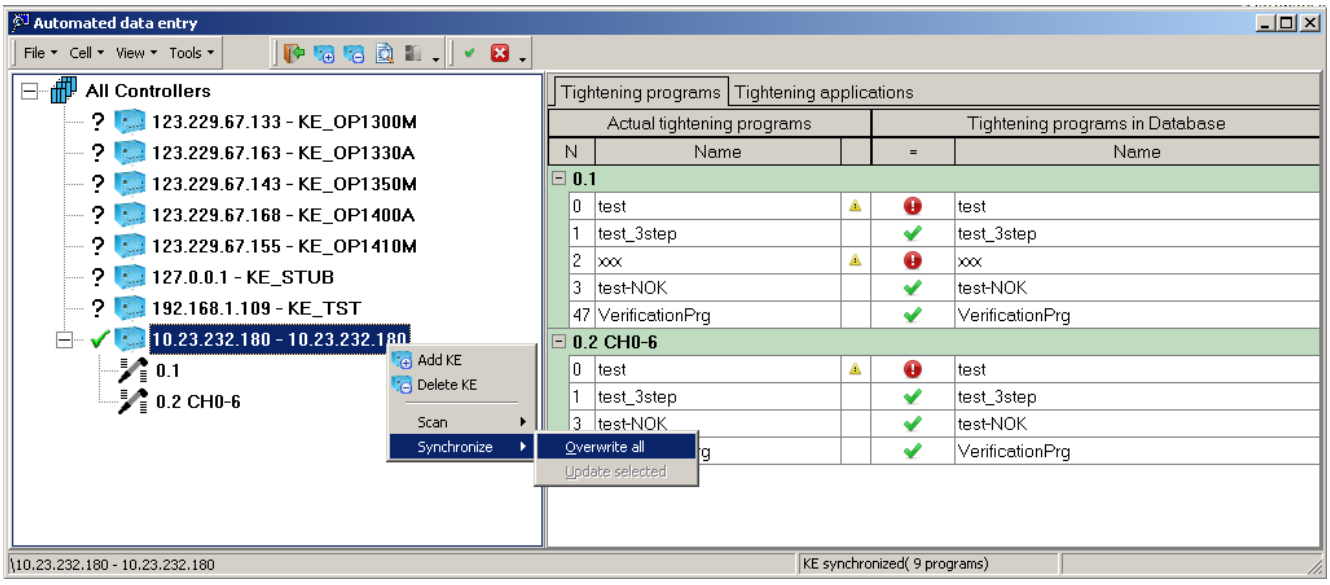


Figure 4-4 Read-in and synchronization of a tightening cell

When transmitting (synchronizing) the data from the tightening system memory, the following information is taken over:

- Name like e.g. channel names, program names or tightening position designations.
- The tightening program structure, particularly step information on steps for which the data output has been activated in the tightening program.

- Monitoring and target function parameters from the tightening steps: For the read-out of information on number and type of the Q-Das characteristics to be created. Apart from that, the characteristic classes and characteristic types are generated automatically.
- Tightening step parameters: In this connection, the limit values and set values for the characteristics are read out.

As this configuration is normally only carried out in the commissioning, another mechanism has to make sure that these uniquely determined parameters won't become obsolete. For this purpose, the QTrans software will check for every received data package whether the configuration is still up-to-date. In case of deviations, the parameters are automatically tracked and the configuration is updated. The tracking works on the basis of the tightening system "docu levels". If new docu levels are activated, new characteristics are also automatically generated in the data output; if docu levels are deleted, the related characteristics will be deleted.

Note: All "important" parameters like command and limit values, serial numbers, etc. are automatically updated. The following parameters are, however, not updated: Channel name and program name. Changes in the spindle assignment (particularly the addition or deletion of tightening spindles) and newly added tightening programs are not updated automatically either (as for this purpose, you must first of all define a tightening position assignment).

Note: The parameter monitoring behavior can be activated or deactivated for individual K fields via the template!

4.3.2 Additional Information

For the entry and administration of additional information that cannot be automatically taken over from the tightening system or that does basically not exist there, the QTrans software provides a K field editor. In this connection, you can basically process two different types of information:

- K field values: If K field values are directly processed, they can either be specified as "Default" (standard value that is only used if there is no other value for the K field) or as "Override" (value that is always used for the output). Alternatively, a K field can be allocated a function (in the template) that will then calculate values in a flexible form and format them, if necessary.
- Template properties: Template properties are variable values that are filled with values during the configuration. This mechanism cooperates closely with the templates: The template defines which properties are available, the user can then process them in the configuration editor. In the generation of the Q-Das datasets, the template can then use these properties in order to calculate K field values.

The K field editor allows for the processing on different levels (see following screenshot).

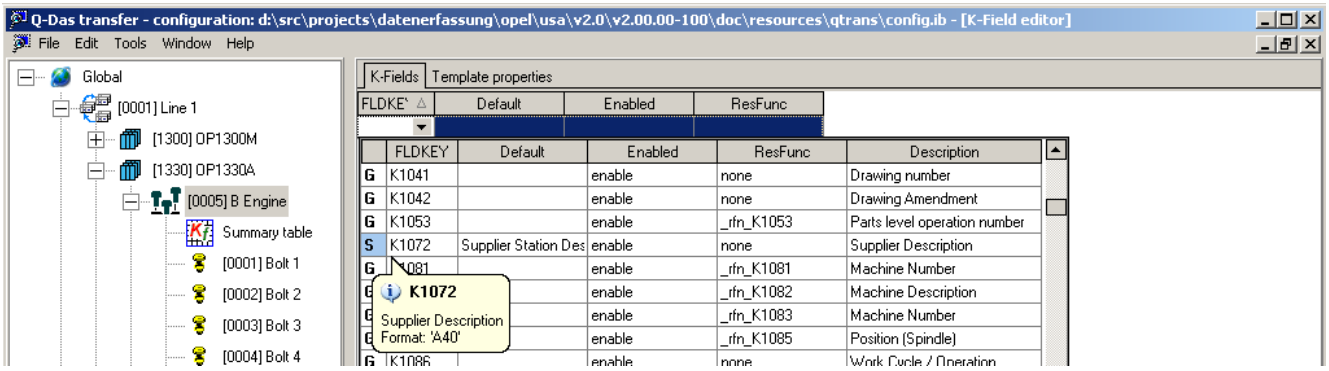
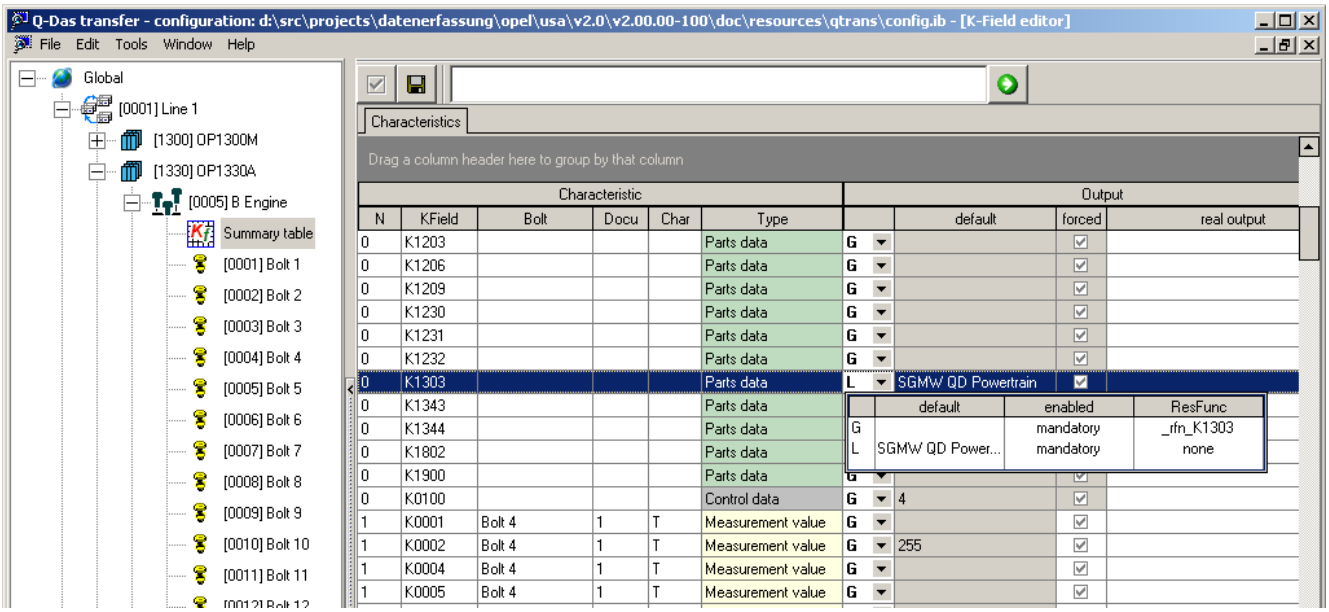


Figure 4-5 K field editor with inheritance

If values are defined on a "higher" level, they also apply to all "lower" levels (the settings are "inherited", if, e.g., a parameter is set on station level, it will also apply to all parts, tightening positions and characteristics, see screenshot: the "S" marking highlighted in blue). In this way, the K field editor allows for an easy determination of joint parameters without the necessity of entering the parameters separately for all characteristics (group processing of a characteristic group is also possible, see QTrans V2.0 Reference).

In addition, the K field editor offers the possibility to examine the actually generated datasets. For this purpose, a "Summary table" entry is contained for each part type in the hierarchy tree. The following screenshot shows an example:


Q-Das transfer - configuration: d:\src\projects\datenerfassung\opel\usa\v2.0\v2.00.00-100\doc\resources\qtrans\config.ib - [K-Field editor]
File Edit Tools Window Help
Global
[0001] Line 1
[1300] OP1300M
[1330] OP1330A
[0005] B Engine
Summary table
[0001] Bolt 1
[0002] Bolt 2
[0003] Bolt 3
[0004] Bolt 4
[0005] Bolt 5
[0006] Bolt 6
[0007] Bolt 7
[0008] Bolt 8
[0009] Bolt 9
[0010] Bolt 10
[0011] Bolt 11
Characteristics
Drag a column header here to group by that column
Characteristic
Output
N KField Bolt Docu Char Type default forced real output
0 K1203 Parts data G
0 K1206 Parts data G
0 K1209 Parts data G
0 K1230 Parts data G
0 K1231 Parts data G
0 K1232 Parts data G
0 K1303 Parts data L SGMW QD Powertrain
0 K1343 Parts data
0 K1344 Parts data
0 K1802 Parts data
0 K1900 Parts data
0 K0100 Control data G 4
1 K0001 Bolt 4 1 T Measurement value G
1 K0002 Bolt 4 1 T Measurement value G 255
1 K0004 Bolt 4 1 T Measurement value G
1 K0005 Bolt 4 1 T Measurement value G
default enabled ResFunc
G mandatory _rfn_K1303
L SGMW QD Power... mandatory none

Here, all K fields are shown in exactly the same form as they will later be generated in the Q-Das result file. So you can easily see which K fields get their values from where (for values manually entered in the K field editor), which characteristics are available, etc. By importing a tightening results file, measurement values can be entered so that the complete processing by the QTrans software can be simulated and the results can be verified. As in other areas of the QTrans software, you can here also use grouping, sorting and filter functions in order to get a quick overview of the desired information.

4.3.3 Global K Field Configuration

QTrans is delivered with the K fields according to AQDEF standard V3.0 category C for tightening technology. In the global K field editor area, you can, however, (depending on the application) change the global list of the

available K fields (to do so, administrator rights are necessary). Here, K fields can be added and removed, global defaults can be defined or K fields can be deactivated (deactivated fields are not written into the Q-Das files). Apart from that, you can here also adjust the data types that are allocated to the relevant K fields.

More information on the global K field configuration is contained in the QTrans V2.0 Reference.

4.4 Generation of the Q-Das Datasets

4.4.1 Data Storage

The QTrans software generates Q-Das files based on the information that is stored in the configuration and updated during the runtime, if applicable (see above). In this connection, each station and each part type is administrated separately and the Q-Das data is saved accordingly, in separate (sub-)directories with the station and/or part type names. More information on the data storage options is contained in the QTrans V2.0 Installation and Administration manual.

4.4.2 Parts Processing Cycle of a Station

The QTrans software works basically in a station-related form, i.e. it collects all tightening results of the nutrunners allocated to a station in a joint pool. In principle, there can only be one component at a time in one station in the line (that is after all the definition of a processing "station") and any and all processing at this component is carried out with the unique part ident (for the tracking). The QTrans software utilizes this criterion in order to internally generate signals for "Parts supply" and "Parts discharge" from the transmitted tightening results data. The software interprets the receipt of tightening results data with a changed part ident as the information that a new component is now processed in the station ("parts supply"). That implies that the previously processed part has now been completed (has left the station) and thus any tightening results data with the part ident received before is now complete ("parts discharge"). At this moment, a complete Q-Das dataset is generated and saved in the file system.

Note: As apart from the unique part ident, the ID code that is transmitted by the tightening controller (with each tightening(!)) may also contain more information, it can be defined in the configuration editor which parts of the entire ID code contain the part ident information.

4.4.3 Generating the K Fields

The QTrans software generates Q-Das data for each part type separately. In the configuration, any information necessary for that purpose is stored.

In this connection, the Q-Das files (dfx, dfd, dfq) are set-up as follows:

- One dataset of a part type consists of:
  - N tightening positions (as defined in the configuration)
  - Per tightening position, a different number of tightening steps are possible. Only tightening steps and the related results, which are marked as docu steps, will be taken over into the Q-Das data.[1]
  - Per tightening step, there may be several characteristics (e.g. torque and angle).

[1] In case of NOK cancelation in a non-docu step, this data will normally be lost. The "virtual tightening step" function allows for the complete saving of all tightening steps (see QTrans V2.0 Reference)

- Per station, only one single dataset is generated for one part. In this connection, processing steps by several tools are allocated to the relevant tightening positions in the dataset.
- If the same tightening position is processed several times, only the processing completed last will be saved in the Q-Das file.[2]

Thus, a Q-Das dataset may, for example, look as follows:

Tightening positions	Tightening position 1						Tightening position 2					
Tightening steps	Docu step 1		Docu step 2		Docu step 3		Docu step 2		Docu step 4		Docu step 6	
Characteristic type	A	T	A	T	A	T	A	T	A	T	A	T
Characteristic number	1	2	3	4	5	6	7	8	9	10	11	12
Measurement values	…	…	…	…	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…	…	…	…

In the example, there are 12 characteristics. The order of the characteristics (characteristic number) is determined by the configuration and an internal sorting as follows:

- Tightening positions are sorted according to the order of their definition in the configuration (i.e. using the tightening position number). All characteristics of tightening position 1 (i.e. all characteristics of all steps of tightening position 1) are output before the characteristics of tightening position 2, etc.
- Steps are sorted according to the order of the docu step number: The characteristics of the step with docu step number 1 are output before the characteristics of the step with number 2, etc.
- Within one step, characteristics are output sorted according to their characteristic type. In this connection, an internal assignment/order is used.

The K field value generation is controlled via the processing pipeline for K fields. In this connection, the following processing steps will be carried out one after the other for each K field that is defined in the global K field list:

1. The K field is initialized with a "default" value (as specified in the K field editor)
2. By means of a processing instruction from the template, the K field can be overwritten with a combination of configuration values or the process values. Here, assignments to catalog values will also be performed, if applicable.
3. By means of an "override" value (as specified in the K field editor), the K field can be given a manually defined value.

As in the standard application, steps 1 and 2 only use information from the tightening system and the tightening position assignment, the system generally provides correct Q-Das files without manual adjustment of the K field values. In order to create a complete dataset according to AQDEF specification, only a few manual entries like e.g. department name (K1101) or works name (K1301) are necessary. This is considerably simplified by the K field editor as the latter allows for the definition of "default" or "override" values for K fields on the line, station, part, tightening position and characteristic level. Thus, field values applying to one line or station don't have to be defined several times for all parts (for more information on the K field editor see QTrans V2.0 Reference).

[2] In this case, the data of the first (NOK) tests will be lost. The "multi-processing" option allows for the saving of all processing steps at a tightening position in a completely understandable form (see QTrans V2.0 Reference)

The following figure shows how the QTrans software generates the quantity of K fields, the K field values and thus the Q-Das datasets from the tightening results data.

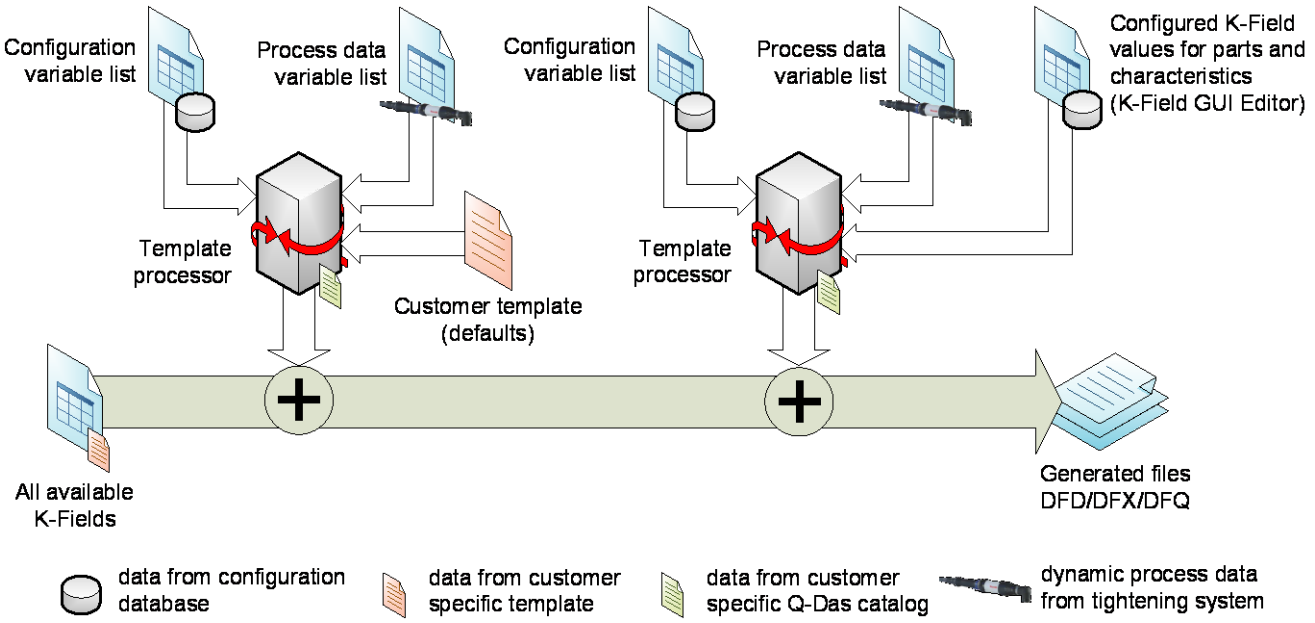

Configuration variable list
Process data variable list
Configuration variable list
Process data variable list
Configured K-Field values for parts and characteristics (K-Field GUI Editor)
Template processor
Customer template (defaults)
Template processor
All available K-Fields
Generated files DFD/DFX/DFQ
data from configuration database
data from customer specific template
data from customer specific Q-Das catalog
dynamic process data from tightening system

Figure 4-6 Processing pipeline for K fields

4.5 Reports

The reports integrated in QTrans are designed for fast and easy-to-use data analyses directly at the production system. Instead of complex statistical analyses on the characteristic level, they provide superordinate information and different comparative views in order to reveal and solve problems in the production. Here, the data quantity is basically limited to the latest parts produced (e.g. the last 10000 parts) in order to guarantee fast interactive operation.

The report window in QTrans offers the possibility to display the tightening results updated in real time in a list and to monitor them. On the basis of this "dynamic report", four more reports can be generated allowing for the retrieval of exact information regarding the data quantity ("drill down"). With every additional report call, filters can be applied in order to reduce the data quantity and to limit it to the relevant information. In addition, the results presentation can then be adjusted for each report interactively, using filters, grouping and sorting options, so that the actually relevant data is easily visible. It goes without saying that all reports can be printed or exported into a file (XML or Excel format).

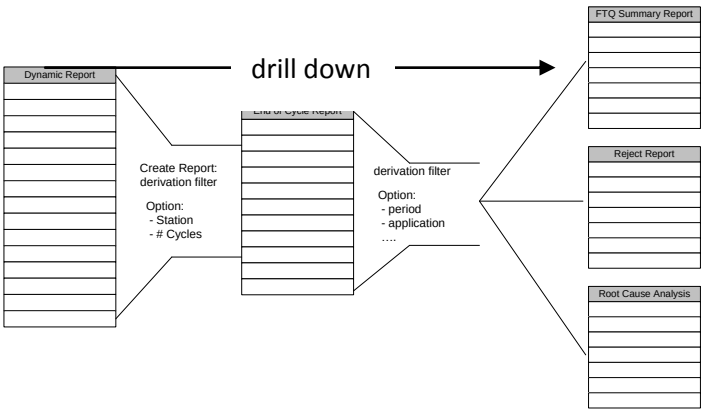


Figure 4-7 Drill down report

4.5.1 Dynamic Report

The dynamic report shows new tightening results in real-time, as received from the tightening system, in a list. Per line, the data of one tightening step is shown. The following screenshot shows an example:

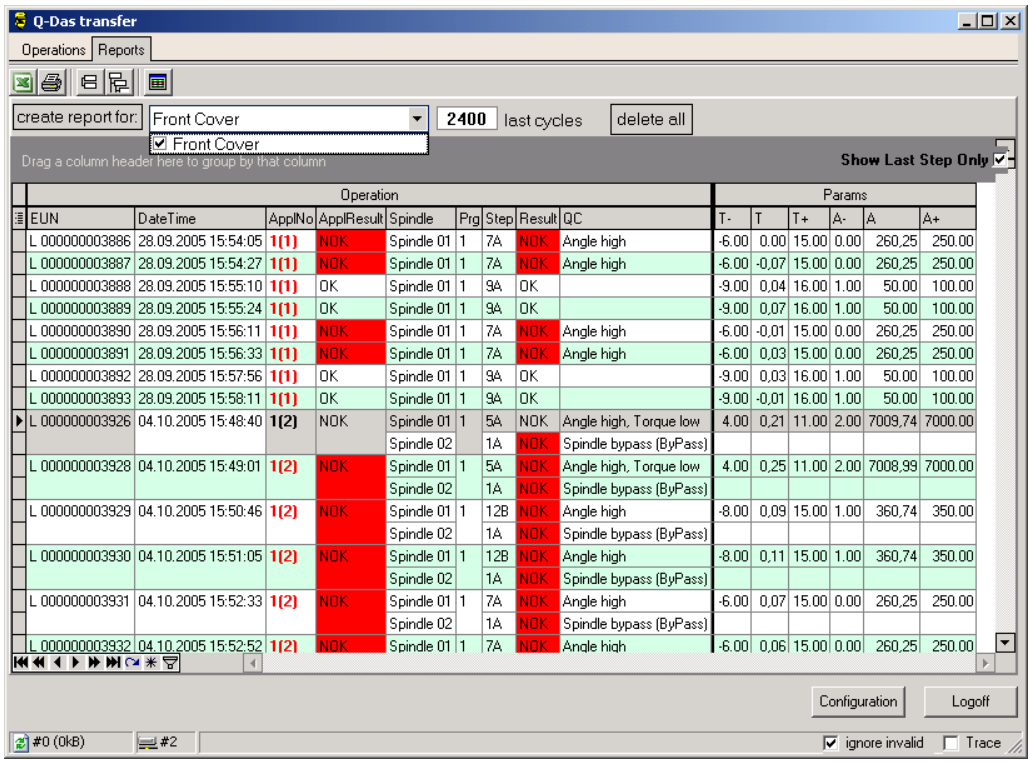


Figure 4-8 Screenshot for dynamic report

Some functions in the dynamic report include (for more: see QTrans V2.0 Reference):

- Generating static reports on the basis of the displayed data
- Print-out and data export (Excel or XML)
- Grouping, filtering and sorting the data, displaying only the result step or all steps
- Reference to NOK tightenings (highlighted in red) and configuration problems (tightening result cannot be allocated to a tightening position – in red font).

4.5.2 Static Reports

Based on the data displayed in the dynamic report, more, so-called "statistic" reports can be generated. As for the further processing, only the displayed datasets are used, the flexible filters available in the dynamic report can be used in order to make a data pre-selection. As compared to the dynamic report in which all the data is listed one below the other without easily recognizable tightening spindle and tightening position assignment (one line per tightening step), all tightening results will be allocated to tightening spindles, parts and tightening positions and shown accordingly for the statistic reports.

4.5.2.1 End of Cycle Report

The first step for the creation of the statistic report is the creation of the "End of Cycle" report. In this connection, the tightening results are re-sorted so that all tightening spindles are listed next to each other. In this connection, the data is sorted according to the part ident so that all tightening results are shown combined for one part. The footer calculates and displays the percentage share of the OK tightenings (FTQ = first time quality, see the following screenshot).

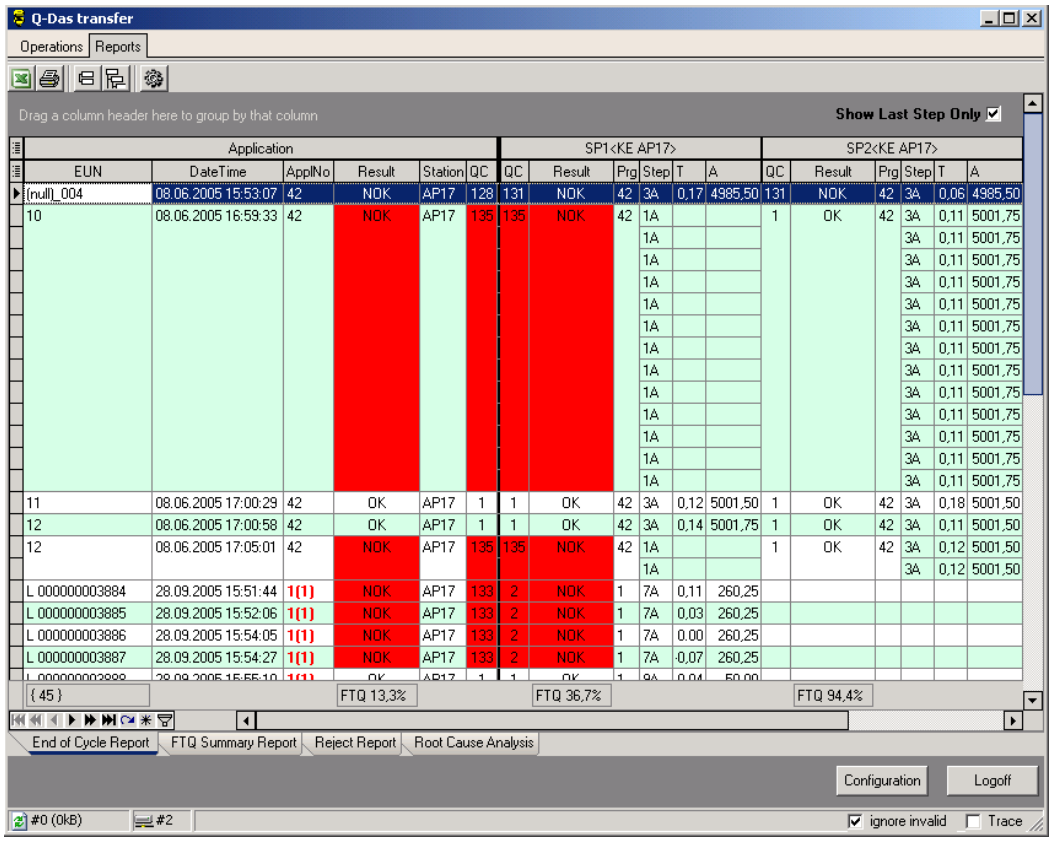


Figure 4-9 End of cycle report

4.5.2.2 Root Cause Analysis

This report shows a summarized listing of the NOK tightenings and sorts and/or groups them according to the NOK reason. The presentation can be displayed from the point of view of the tightening step, the program, the tightening application or the station so that you can easily get an overview of the selected group or compare them with each other (e. g. which station produces most NOKs?). The individual entries will then show the number of NOK tightenings per tightening step, tightening program, tightening spindle, etc. so that extraordinary deviations (e. g. spindle positioning errors, frequent cancelations in a certain tightening step) can be identified and optimized and/or removed (see the following screenshot).

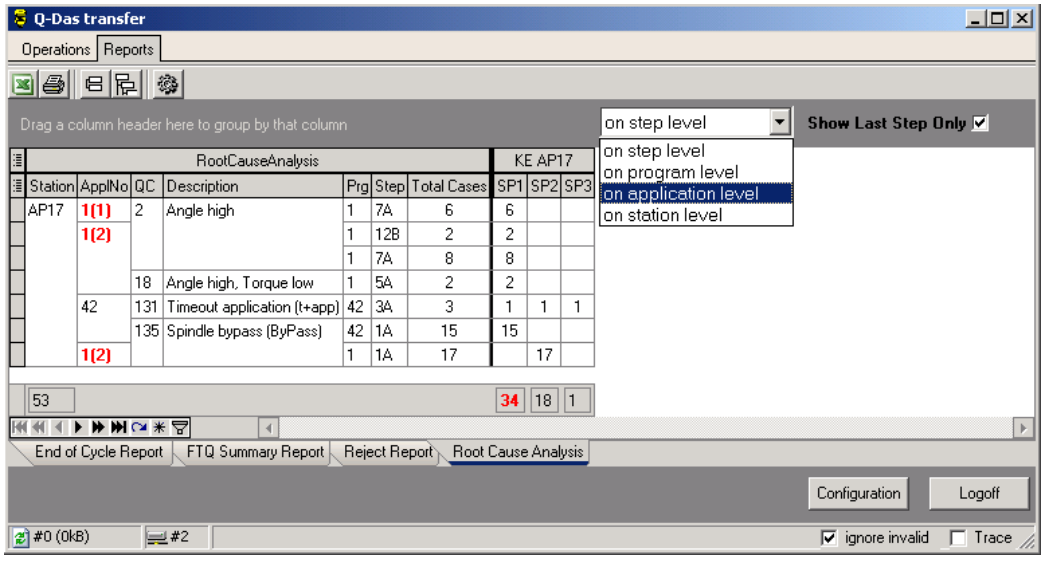


Figure 4-10 Report for root cause analysis

In addition, the footer calculates a vertical total so that an interactive analysis as with a cross table becomes possible.

4.5.2.3 FTQ Report

The FTQ report provides information on the OK and NOK number related to the tightening spindle or the tightening application (and/or tightening program). This report offers a simple but nevertheless powerful option to examine and compare tightening results.

If the results in this report are grouped, you can, e.g. compare tightening spindles with each other and problems with individual spindles become easily visible (e. g. mechanical problems like e.g. positioning or tool wear).

If the tightening systems use different tightening programs or tightening applications for tightening different tightening positions or part types, the grouping function can also be used in order to identify the extraordinary deviations.

By means of the grouping and sorting functions, this report generally offers a possibility to identify the most frequent problems at the stations. If these problems are removed, the production quality can be improved effectively.

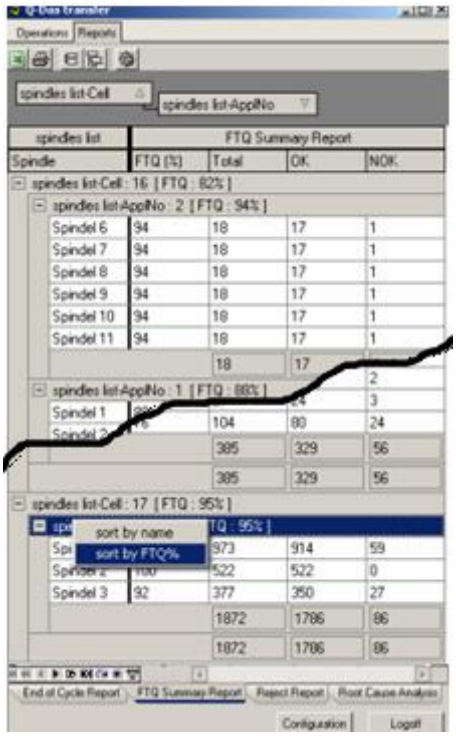


Figure 4-11 FTQ report

4.5.2.4 Reject Report

The reject report functions similarly to the end of cycle report. The displayed data is, however, filtered automatically and the columns displayed by default contain a more exact description of the NOK cause (see the following screenshot).

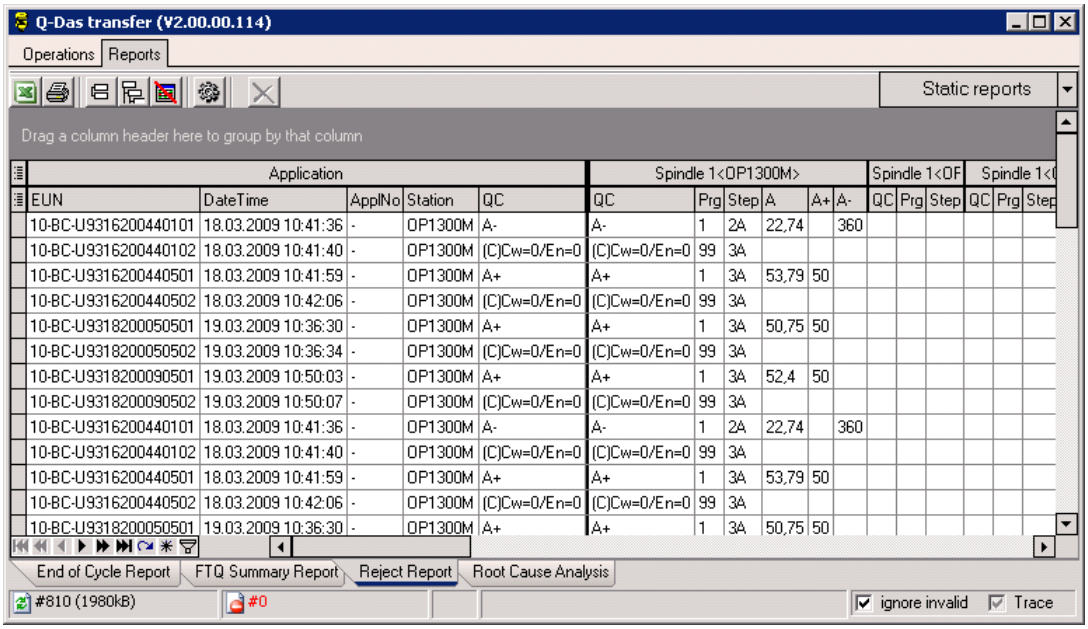


Figure 4-12 Reject report

4.6 Capability Studies

Apart from production data processing, QTrans offers support for the implementation of capability studies and the saving of the study data in the Q-Das format. For all capability studies, standard parameters (like e.g. the necessary number of measurements) can be specified in the configuration so that the operation is standardized and simplified.

4.6.1 Machine and Process Capability Tests

Here, you can switch QTrans into an operating mode for which the data of one or several stations is temporarily not saved in the default production dataset but in a separate file. After completion of the specified number of parts, QTrans will automatically switch back to the creation of default production data.[3]

The following screenshots show an example of the machine capability and process capability studies:

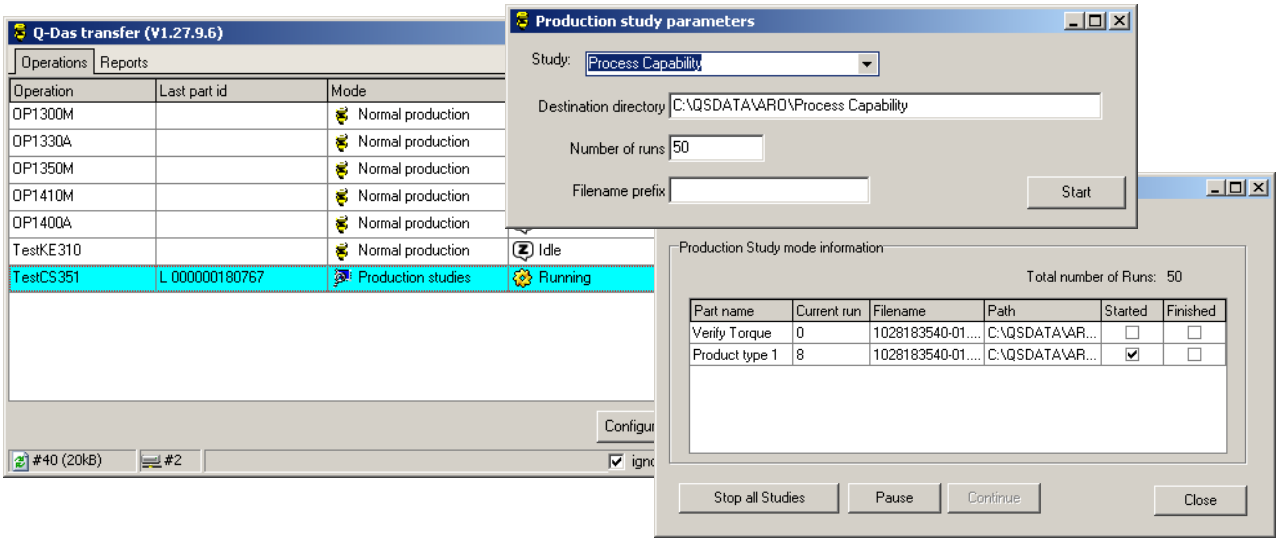


Figure 4-13 QTrans operating modes

4.6.2 Measurement System Analyses

In this connection, QTrans is able to control a tightening system and carry out the required number of tightening attempts. In this connection, the operator is led through the sequence and gets step-by-step instructions for the correct process implementation. Depending on the analysis type (QTrans supports type 1 and type 1A), the data is automatically read in by a reference measuring system and also included in the result dataset. The measurement procedure (e. g. 50 measurements) is than completed automatically without the need of manual user interventions.

The measurement system analysis can also be carried out in portable form as no changes in the tightening system configuration are necessary for controlling the tightening system and transferring the data for the individual measurements. Apart from the communication via a network, communication with the tightening system is also possible via a serial or the USB interface (only system 350).

The following screenshots show how the function has been realized in QTrans:

[3] MCS and PCS are only available if QTrans has not been installed as Windows service.

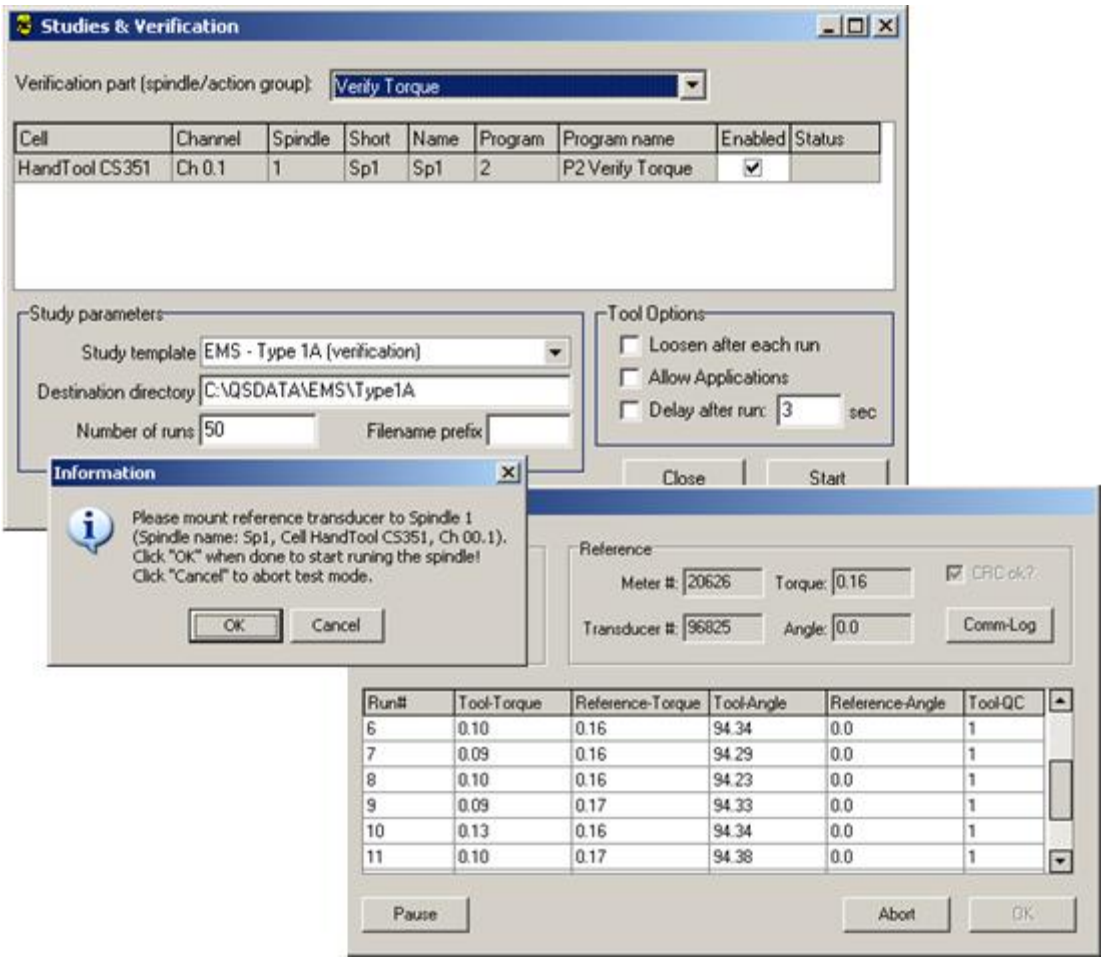


Figure 4-14 User guidance for measurement system analyses

5 Operation

5.1 Start

The installation configures QTrans with an auto boot function. Depending on the installed version (as Windows service or as desktop application), QTrans is then either started upon system start (system service) or after a user's log-off (desktop application).

By default, the installer creates three shortcuts in the Windows start menu under Start → Programs → BoschRexroth AG → QTrans:

- QTrans: Depending on the installation type, this shortcut starts QTrans either in the Report Viewer mode, as standalone application or as Tool Verification GUI.
- DBEdit: This shortcut starts the configuration editor.
- User manual: Opens a pdf version of this user manual.

5.2 User Login

If QTrans is run in the standalone mode, a user login is necessary for changing the station status (i.e. for starting capability measurements). Access to the configuration database is controlled by means of rights in the file system – the administrator can then determine these rights accordingly for Windows users or groups.

Note: More information on the user login and on access rights is contained in the QTrans V2.0 Installation and Administration manual.

5.3 User Interface Elements

5.3.1 Program Window

The QTrans and DBEdit program windows contain the following elements in the user interface:

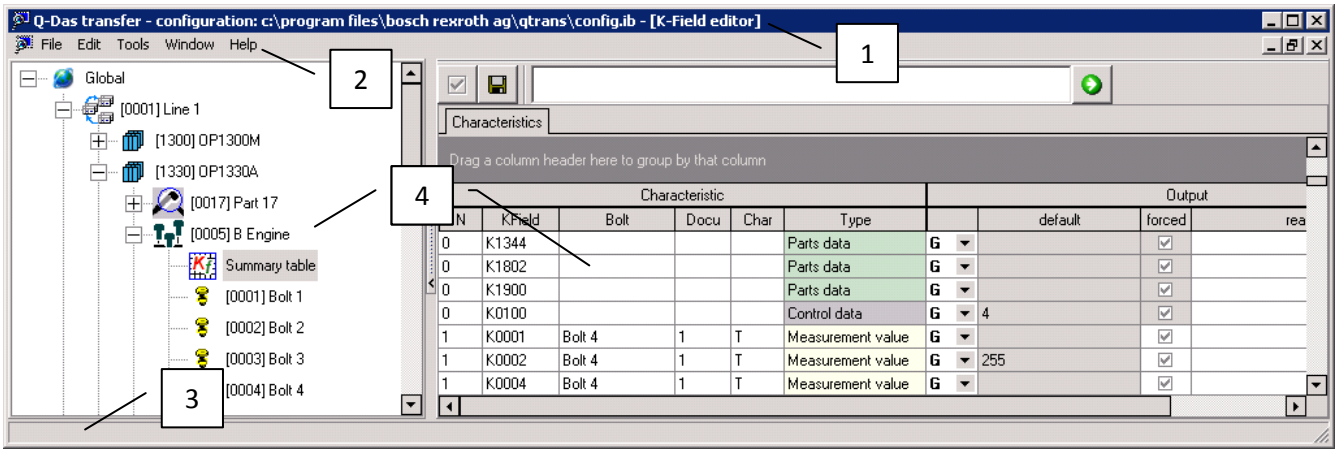

Q-Das transfer - configuration: c:\program files\bosch rexroth ag\qtrans\config.ib - [K-Field editor]
File Edit Tools Window Help
1
2
3
4
Global
[0001] Line 1
[1300] OP1300M
[1330] OP1330A
[0017] Part 17
[0005] B Engine
Summary table
[0001] Bolt 1
[0002] Bolt 2
[0003] Bolt 3
[0004] Bolt 4
Characteristics
Drag a column header here to group by that column
Characteristic
Output
N KField Bolt Docu Char Type default forced rea
0 K1344 Parts data G
0 K1802 Parts data G
0 K1900 Parts data G
0 K0100 Control data G 4
1 K0001 Bolt 4 1 T Measurement value G
1 K0002 Bolt 4 1 T Measurement value G 255
1 K0004 Bolt 4 1 T Measurement value G

Figure 5-1 Screenshot GUI interface elements

The following elements are contained:

1. Window title: Shows the name of the application and additional information (document name), if applicable
2. Menu bar: Contains the application main menu, optionally additional toolbars

3. Status line: Displays additional information.
4. Window area: Contains the application-specific data range and document area.

5.3.2 Tables

At several locations, QTrans and DBEdit use tables for the presentation and entry of data. The tables offer many joint functions for the adjustment and optimization of the view. The following screenshot shows which options are available:

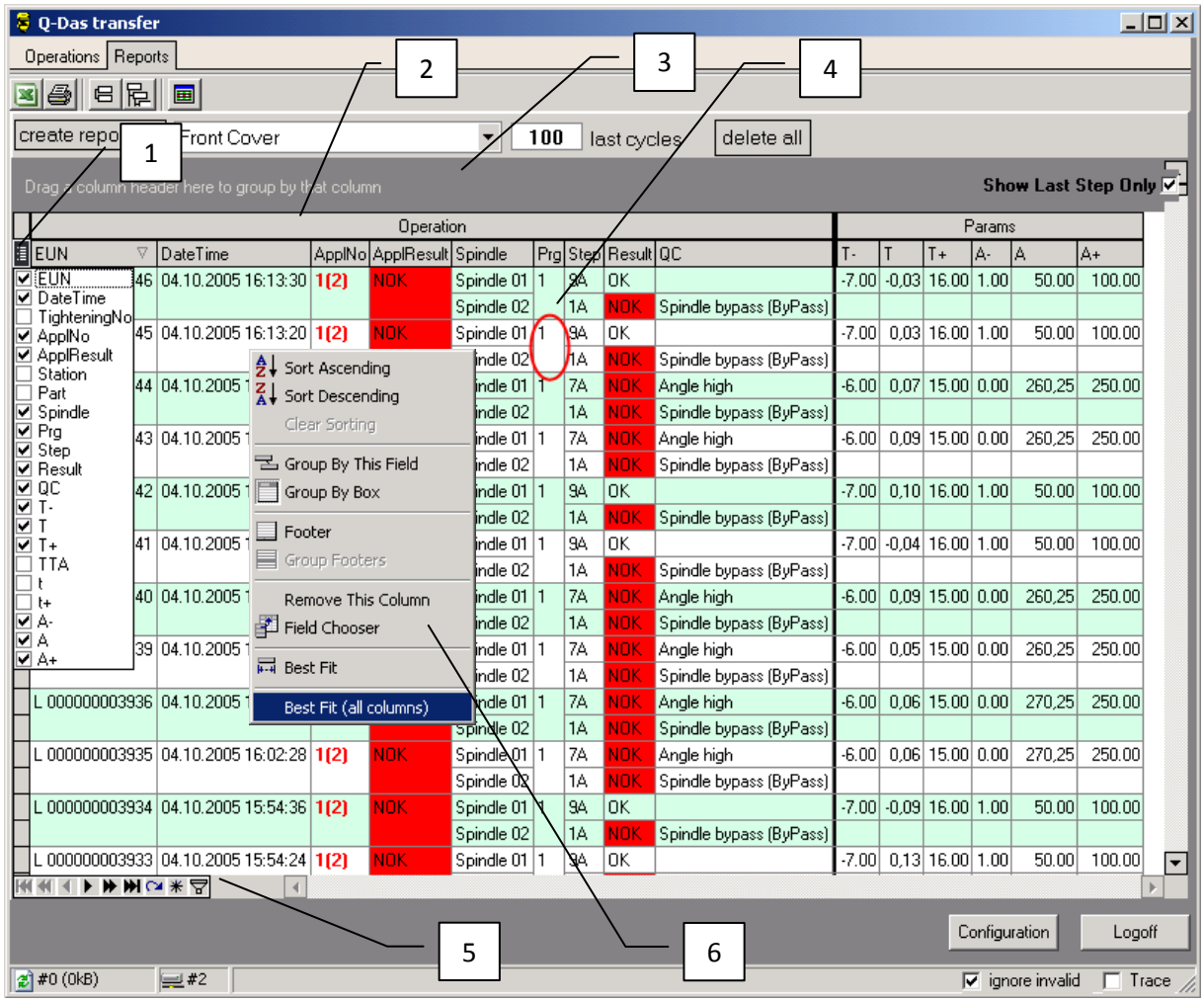


Figure 5-2 Tables in the GUI

The following elements are available:

1. Column selection. By clicking on this box, the menu is shown which displays all columns that are available in the table. If you tick a box, the corresponding column will be shown. Alternatively, the column selection can be called via the context menu and the "Column selection" entry.
2. Column headers: Columns and column groups display a labeling for the columns. By clicking on the column header, column filters ("quick filters") and column sorting can be adjusted.
3. Grouping field: By dragging & dropping a column header into this area, the displayed data can be grouped according to the column.
4. Summarized cells: As in Excel, cells with identical values can be summarized in order to increase the clarity.
5. Navigation area: By means of the symbols in the navigation area, more functions can be called, e.g. the filter dialog (can also be accessed via the context menu).

6. Context menu: Can be called by clicking in the table with the right mouse button and offers more functions like e.g. automatically (re-)calculate the optimal column width.

5.4 QTrans GUI

After having started the QTrans software, the main window of the QTrans software will be displayed as follows:

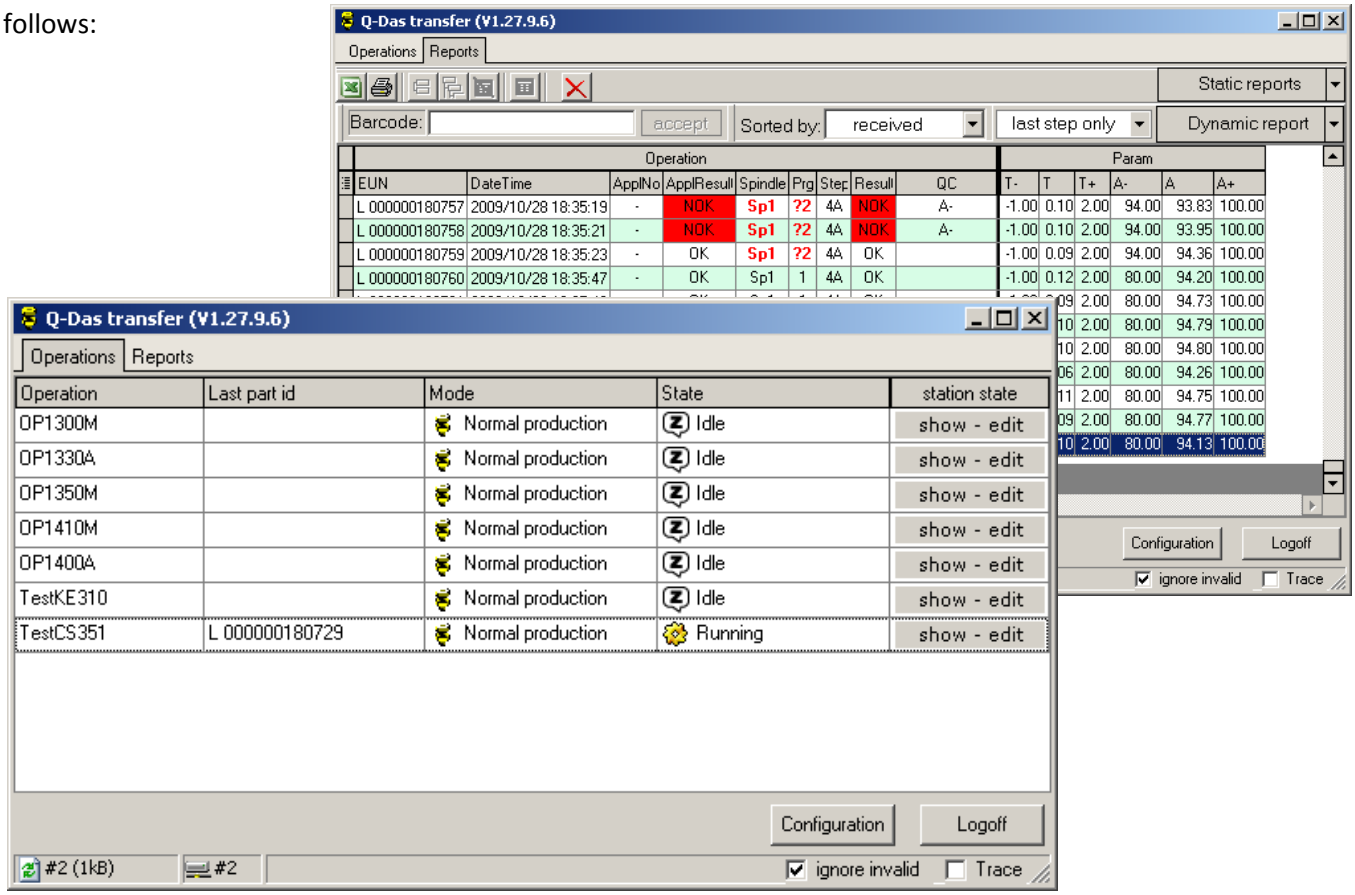


Figure 5-3 QTrans main window

Depending on the operating mode, only the "Reports" index card (for the Report Client mode) or both index cards will be shown (standalone or Tool Verification mode). In the lower part of the window, buttons for accessing the configuration and for logging users on and off are shown (again according to the operating mode).

If the "Operations" index card is active, an overview of the state of the configured stations of this installation is shown (which component has been processed last in each station) and functions for changing the operating state of individual stations (for capability studies) are made available ("show - edit" buttons).

If the "Reports" index card is selected, the list of the tightening results received last will be displayed (the "dynamic report", see above). From here, you can then generate the additional ("static") reports and analyze the data.

5.5 Performing a Measurement System Analysis

For performing a measurement system analysis, you should proceed as follows: In QTrans on the "Operations" index card, you first of all click on the "show - edit" button of the station for which the capability study is to be performed. Then, QTrans shows the following dialog:

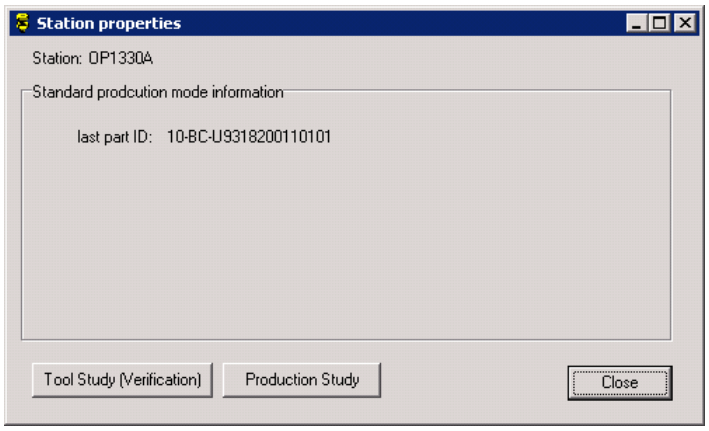


Figure 5-4 Screenshot Changing the station state

This dialog shows details on the current station state. If here, you click on the "Tool Study" button, the user guidance for the measurement system analysis is started. Then, QTrans shows the following dialog:

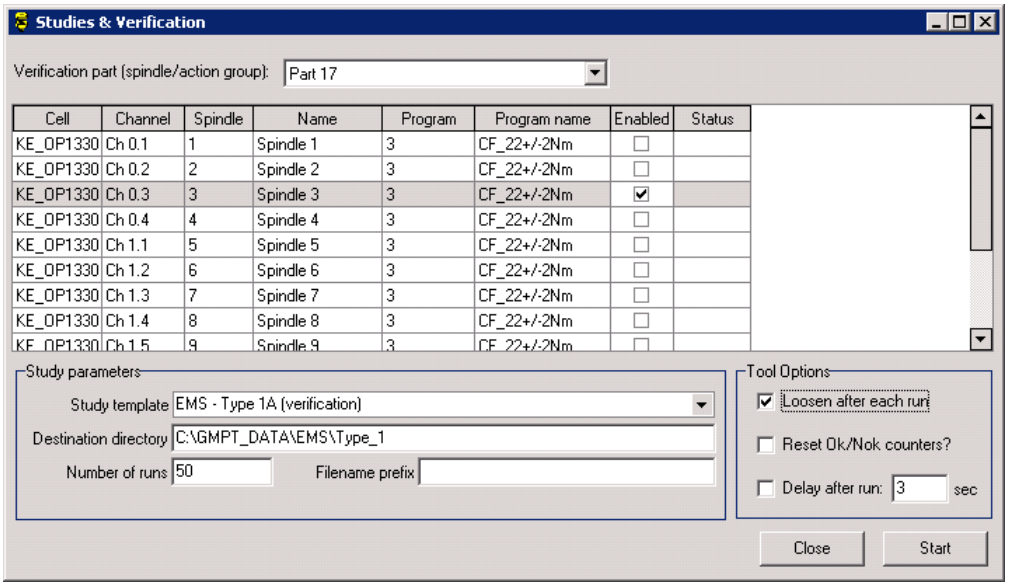

Studies & Verification
Verification part (spindle/action group): Part 17
Cell Channel Spindle Name Program Program name Enabled Status
KE_OP1330 Ch 0.1 1 Spindle 1 3 CF_22+/-2Nm
KE_OP1330 Ch 0.2 2 Spindle 2 3 CF_22+/-2Nm
KE_OP1330 Ch 0.3 3 Spindle 3 3 CF_22+/-2Nm
KE_OP1330 Ch 0.4 4 Spindle 4 3 CF_22+/-2Nm
KE_OP1330 Ch 1.1 5 Spindle 5 3 CF_22+/-2Nm
KE_OP1330 Ch 1.2 6 Spindle 6 3 CF_22+/-2Nm
KE_OP1330 Ch 1.3 7 Spindle 7 3 CF_22+/-2Nm
KE_OP1330 Ch 1.4 8 Spindle 8 3 CF_22+/-2Nm
KE_OP1330 Ch 1.5 9 Spindle 9 3 CF_22+/-2Nm
Study parameters
Study template EMS - Type 1A (verification)
Destination directory C:\GMPT_DATA\EMS\Type_1
Number of runs 50
Filename prefix
Tool Options
Loosen after each run
Reset Ok/Nok counters?
Delay after run: 3 sec
Close
Start

Figure 5-5 Screenshot Start measurement system analysis

Here, you can now select the spindles for the study. If several spindles are selected, the specified number of measurements will be carried out for each spindle and the results will be saved in a joint dfq file. The processing order is determined by the displayed order – it can be easily changed by re-sorting it.

By pressing the "Start" button, the measurement series is started with the specified number of measurements for one spindle. In this connection, the operator is provided with the following information:

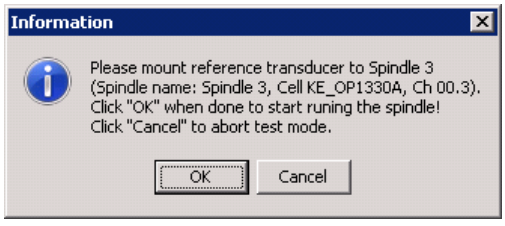

Information
Please mount reference transducer to Spindle 3
(Spindle name: Spindle 3, Cell KE_OP1330A, Ch 00.3).
Click "OK" when done to start runing the spindle!
Click "Cancel" to abort test mode.
OK
Cancel

Figure 5-6 Screenshot Operator information in capability studies

After the correct study environment set-up has been confirmed, the nutrunner is started with the preselected tightening program and the measurements of the reference measurement system are transferred, if applicable. The measurement progress is indicated as follows:

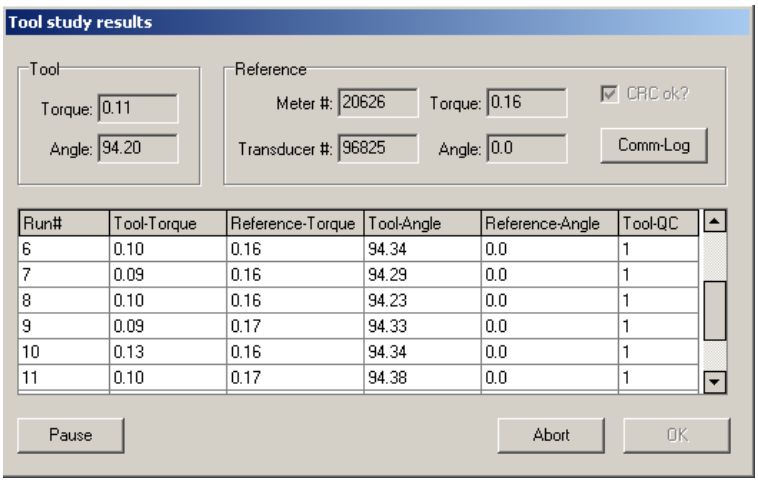


Figure 5-7 Screenshot Progress reference measurement

After completion of the measurement series, another window with user information will be shown (for changing to a new tightening spindle) or the study is completed and the result file (dfq) is saved. After completion of the study, the station is automatically switched back into the default operating mode for the collection, conversion and forwarding of the process data.

5.6 Performing a Machine or Process Capability Test

For performing a MCS or PCS, you should proceed as follows: In QTrans on the "Operations" index card, you first of all click on the "show - edit" button of the station for which the capability study is to be performed. Then, QTrans shows the following dialog:

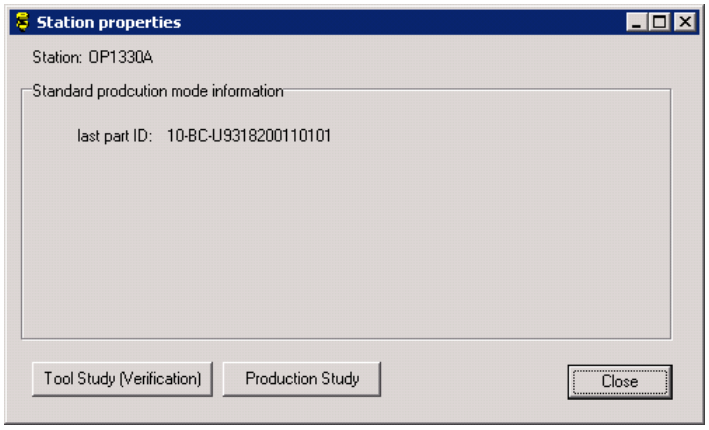


Figure 5-8 Screenshot Changing the station state

This dialog shows details on the current station state. If here, you click on the "Production Study" button, a dialog for selecting the study parameters will be displayed, looking as follows:

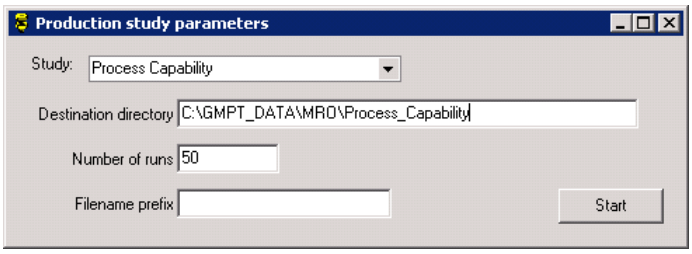


Figure 5-9 Screenshot Parameters for PCS/MCS

After entry of the parameters (or selection from the list of pre-defined parameter sets), the station is switched into the PCS/MCS operation by pressing the "Start" button. From this time, tightening results data will not be written into the default Q-Das files any more but into the directory selected above.

The station will remain in this "operating mode" until the specified number of measurements for each part type processed during the measurement series has been carried out completely. While this operating mode is active, the station state will be displayed in QTrans on the "Operations" index card as shown in the following figure:

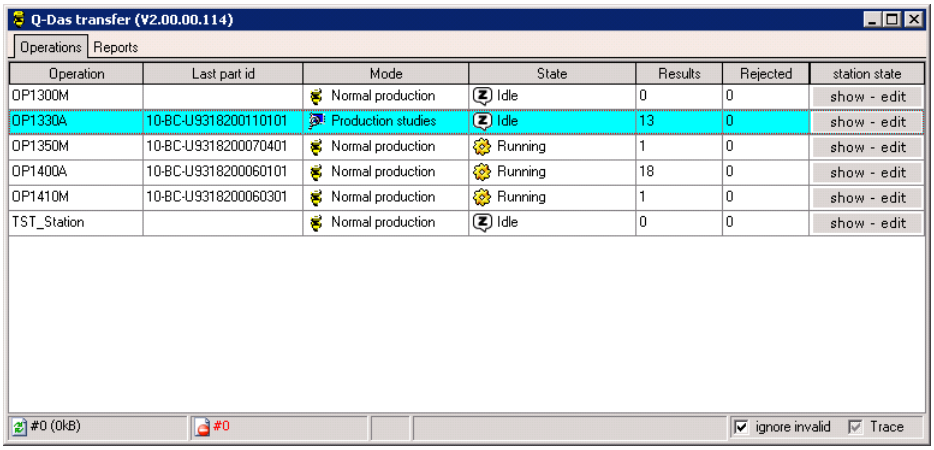

Q-Das transfer (V2.00.00.114)
Operations
Reports
Operation | Last part id | Mode | State | Results | Rejected | station state
OP1300M | | Normal production | Idle | 0 | 0 | show - edit
OP1330A | 10-BC-U9318200110101 | Production studies | Idle | 13 | 0 | show - edit
OP1350M | 10-BC-U9318200070401 | Normal production | Running | 1 | 0 | show - edit
OP1400A | 10-BC-U9318200060101 | Normal production | Running | 18 | 0 | show - edit
OP1410M | 10-BC-U9318200060301 | Normal production | Running | 1 | 0 | show - edit
TST_Station | | Normal production | Idle | 0 | 0 | show - edit
#0 (0kB)
#0
ignore invalid
Trace

Figure 5-10 Screenshot Station state during MCS/PCS

By clicking on "show - edit" once again, details on the current state can be displayed:

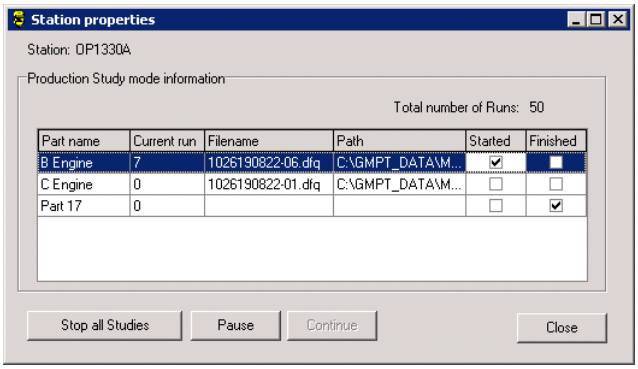

Station properties
Station: OP1330A
Production Study mode information
Total number of Runs: 50
Part name | Current run | Filename | Path | Started | Finished
B Engine | 7 | 1026190822-06.dfq | C:\GMPT_DATA\M... | | |
C Engine | 0 | 1026190822-01.dfq | C:\GMPT_DATA\M... | | |
Part 17 | 0 | | | | |
Stop all Studies
Pause
Continue
Close

Figure 5-11 Screenshot Station state details

Here, the MCS or PCS can also be stopped or paused (in order to continue it later, if applicable).

6 Configuration

6.1 DBEdit GUI

After having started the configuration software (DBEdit), the DBEdit main window will be displayed as follows:

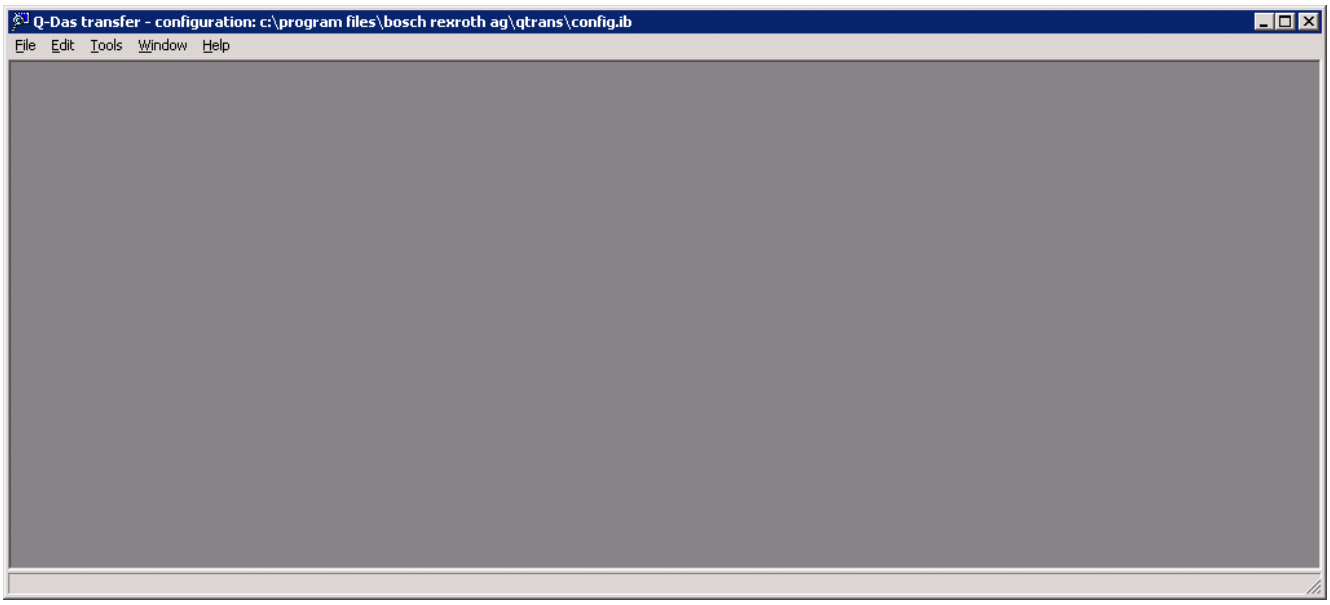


Figure 6-1 Screenshot DBEdit main window

After the start, the current configuration will be loaded automatically (see window title line). Via the main menu, the following functions can be called:

- File menu: Opening and saving configuration data, exchanging files with the server (import and export for remote configuration) and closing the configuration editor.
- Edit menu: Here, the different editors for the parameterization can be opened:
  - Global parameters: Configuring the global settings
  - Lines: Editor for the assignment between tightening system and logic line configuration, tightening position assignment and part definition. Here, you can also transfer the data from the tightening system.
  - K fields: Editor for the K field data processing.
- Tools: Contains different tools for the direct data access (administrator)
- Window and Help: Standard menus as known from other Windows applications.

More details are described in the "QTrans V2.0 Reference" manual.

6.2 Set-up of a New Station

For setting up a new station, the following steps have to be carried out in DBEdit:

- Creation of one or several tightening cells (belonging to the station)
- Creation of a line and one station in this line
- Assignment of the tightening cell tightening channels to the station's tightening spindles
- Creation of part types that are processes in the station and assignment of the tightening programs to tightening positions for the individual part types.

All operations are carried out in the line editor (Edit → Lines) in the configuration editor. Assignments between the individual areas are set up by means of drag&drop.

After start, the line editor looks as follows (if no information has been stored, yet):

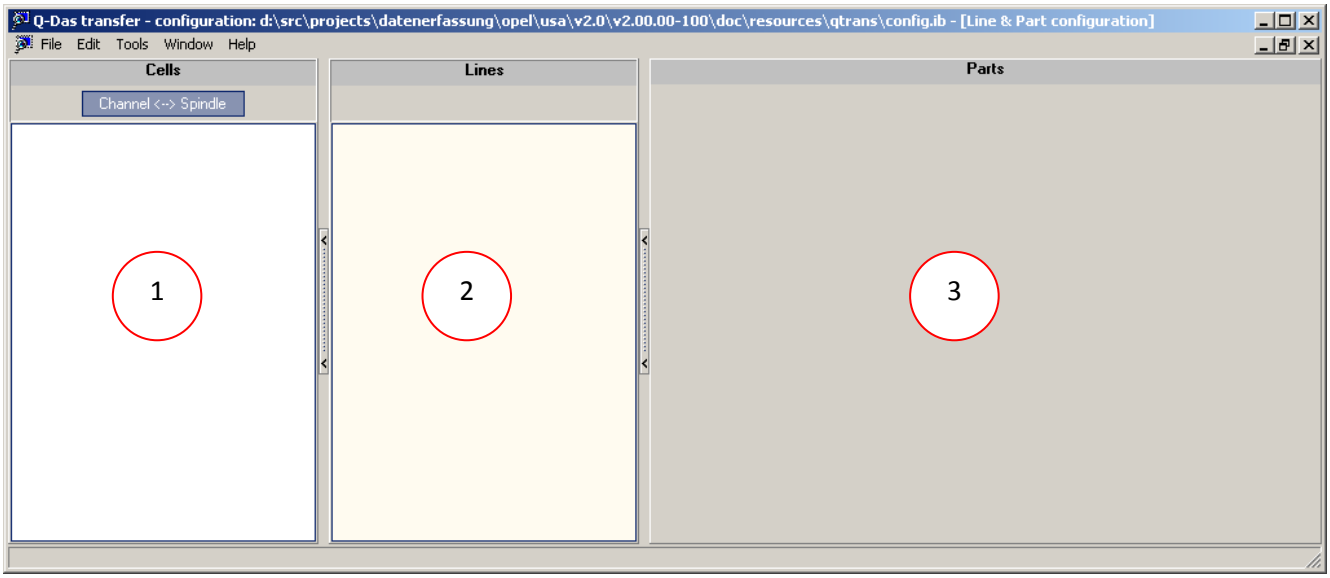


Figure 6-2 Screenshot Line editor (empty)

The window is divided into three separate areas:

1. Area for tightening cells: Here, information on the tightening cells registered in the system is displayed as tree: Tightening cells, tightening channels, tightening programs and tightening applications.
2. Area for the line: Here, information on the logic line structure is displayed as tree: Lines, stations and spindles.
3. Area for part definition: Here, part types and tightening positions for the station currently selected in area ① are displayed.

In every area, you can call a context menu by clicking with the right mouse button; this menu contains the respectively valid commands.

The following sections show how a new station is created and completely configured.

6.2.1 Creating a Tightening Cell

For creating a tightening cell, you must perform a mouse click in area ① of the tightening cells and select the "new cell" function. This opens the window for the automated data entry and asks for data for the tightening cell to be newly created (see following screenshot).

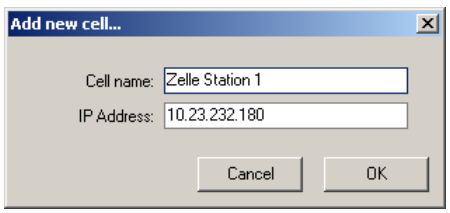


Figure 6-3 Screenshot Parameters for new tightening cell

Here, you must now enter the name and the TCP/IP address of the tightening system (the tightening cell). After clicking on "OK", a new cell will be entered in the window for the automated data entry as shown in the following screenshot (the question mark preceding the entry shows that the tightening system has not yet read in any current values).

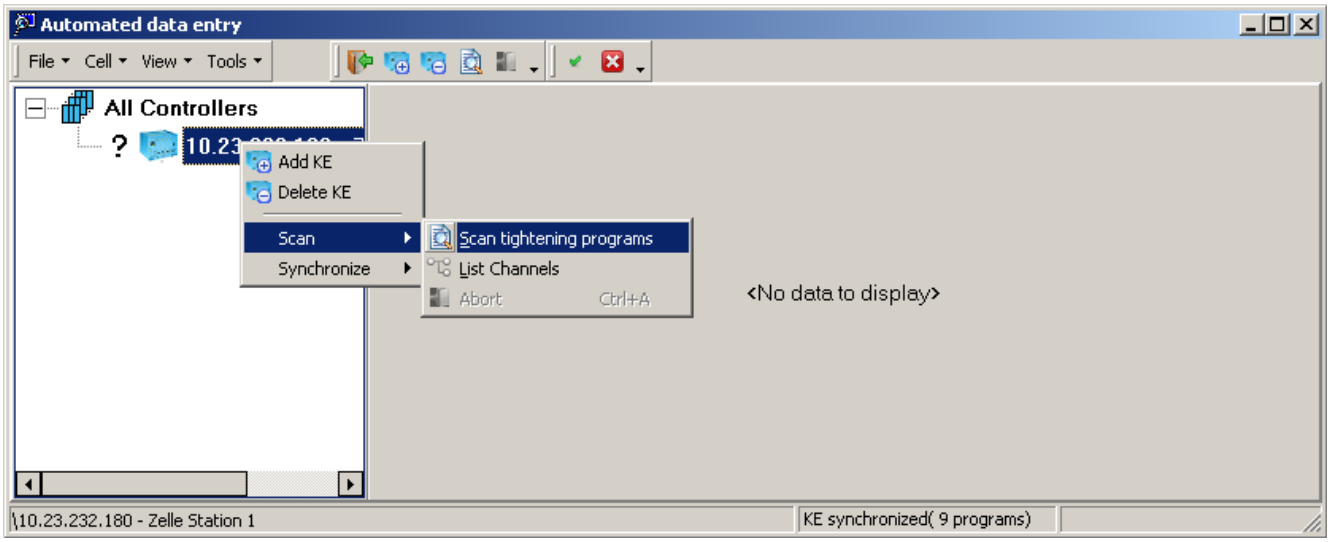


Figure 6-4 Screenshot Start automated data entry from tightening cell

A right click on the cell and selection of the menu entry Scan → Scan tightening programs (or clicking on the corresponding button in the toolbar) starts the automated data entry from the tightening system. Here, the progress of the automated data entry is shown in the status line. After completion of the automated data entry, the data is displayed as follows:

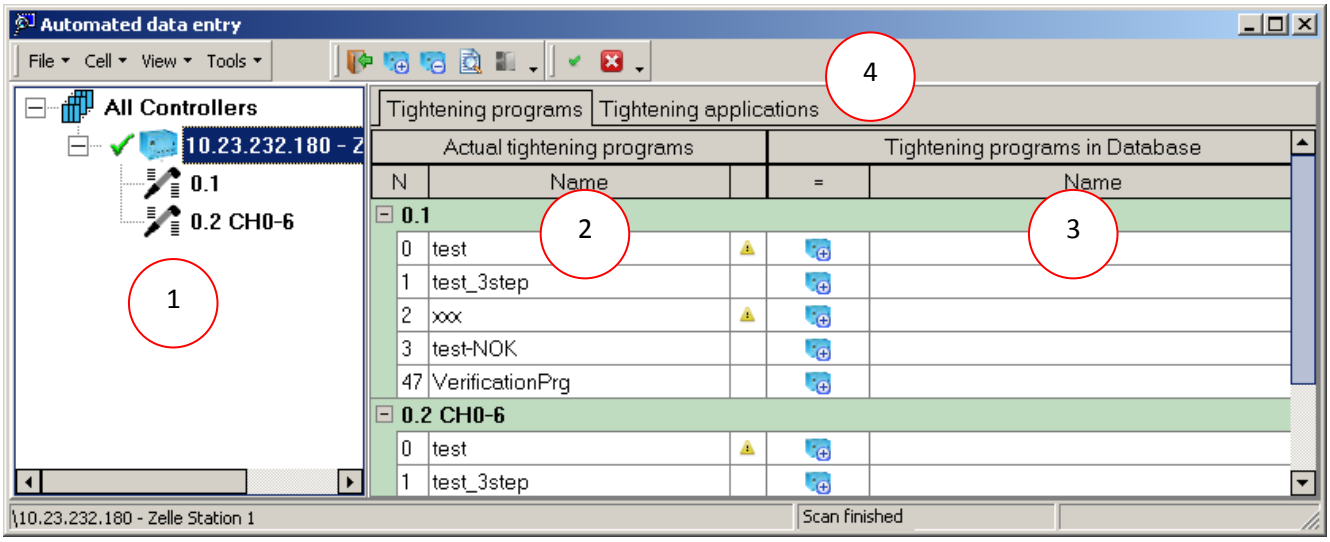


Figure 6-5 Screenshot New data received from tightening cell

In area ①, the tightening channels are displayed that are connected to the tightening system. In area ②, the new data read in by the nutrunner is displayed and in area ③ (that is currently still empty), the data is displayed that is currently saved in the configuration. The automated data entry processes both, tightening programs and tightening applications; this is shown on separate index cards (see ④ in the screenshot). In the area between the tightening system data)②) and the configuration data (③), an information column is shown indicating whether the information between tightening system and local configuration is synchronous. Here,

the local configuration does not contain any information yet; thus, the symbol is shown (information that the program is to be newly transferred into the configuration).

For each tightening program (or also tightening application), another column with additional information is shown in addition to the number and the name. If here, a yellow exclamation mark is shown, the tightening program or the tightening application has not been correctly prepared for the use with QTrans (e. g. no docu steps have been defined). By double-clicking on the line concerned, another window with detailed information can be opened.

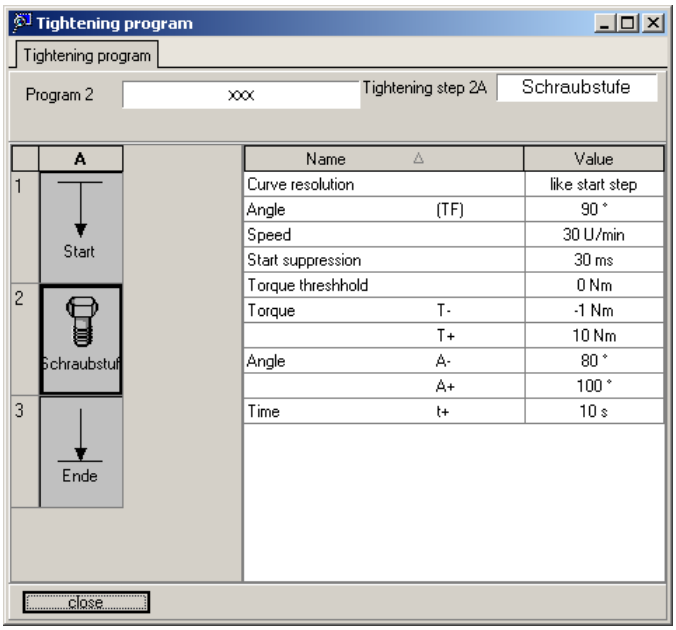


Figure 6-6 Screenshot Program display

You can see that for these tightening programs, no docu steps have been defined – this has to be rectified, if necessary (using the tightening system parameterization software BS350).

After the data has been read in by the tightening system, they can now be transferred into the configuration. This process is started by clicking on the cell (or also on "All Controllers") using the right mouse button and selecting Synchronize → Overwrite all.

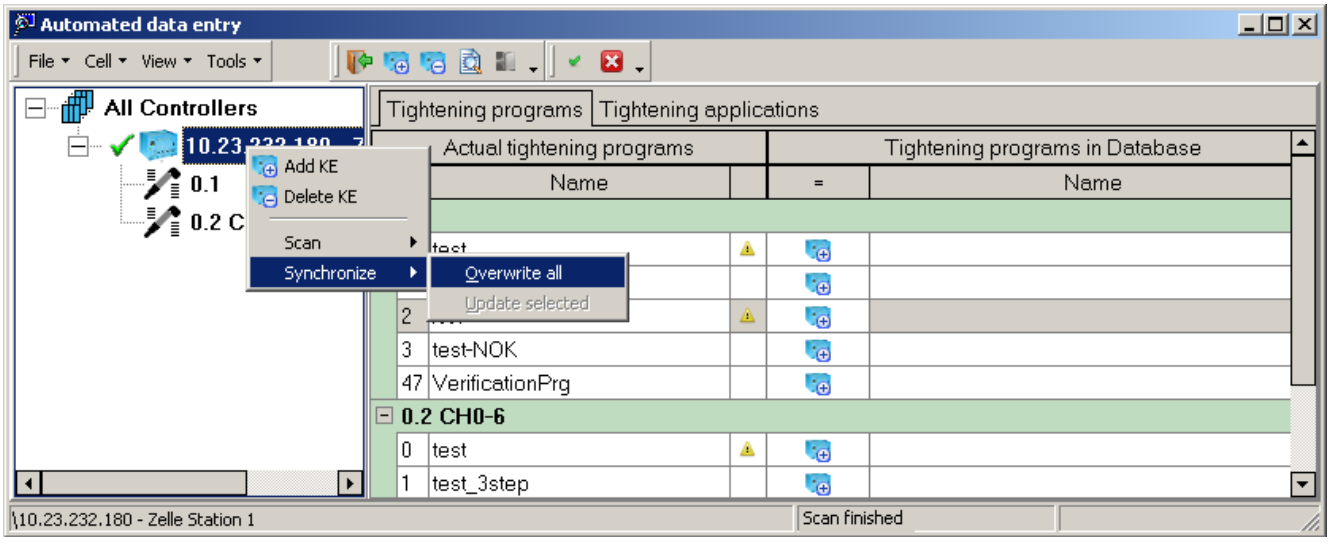


Figure 6-7 Screenshot Start synchronization

The processing state is again shown in the status line. After synchronization has been completed, the display is updated so that the data is displayed as follows:

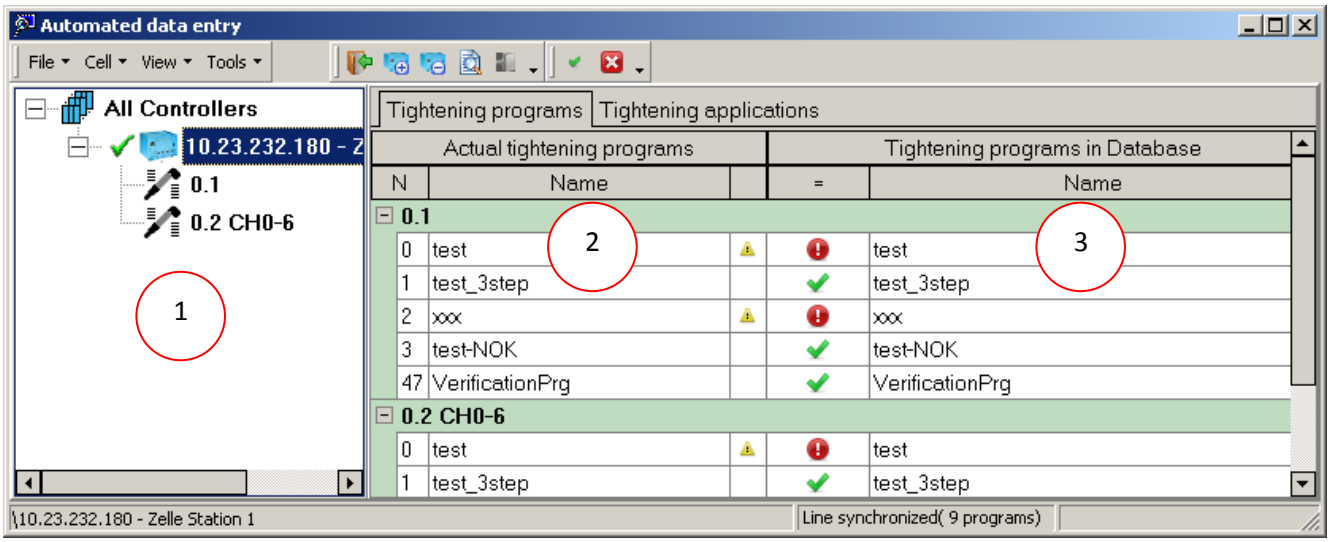


Figure 6-8 Screenshot Synchronization result

You can see that in area ③ of the configuration view, the numbers and names have now been transferred and the numbers and names comply with the information from the tightening system (area ②). The column between area ② and ③ does, however, not show the ✔ symbol (for compliance) for all programs but also the ❗ symbol (for not identical). By double-clocking on one line, you can again open the detail view:

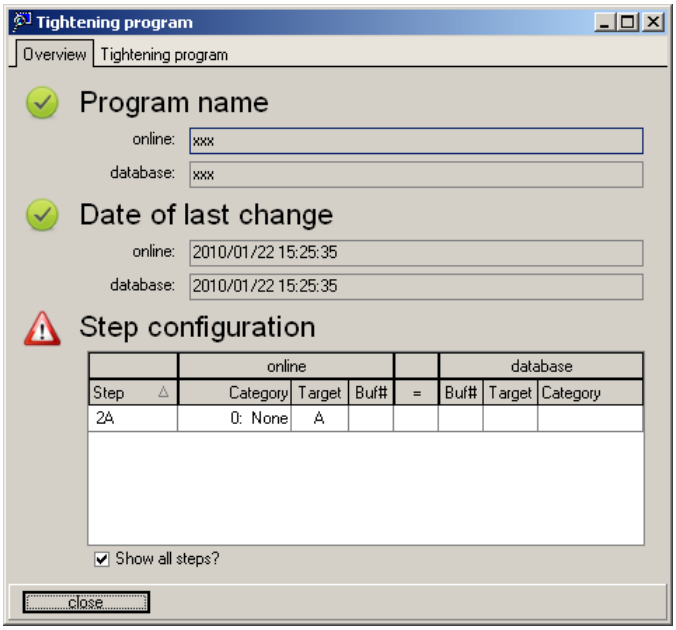


Figure 6-9 Screenshot Detail view program comparison

On the "Overview" index card, this view now shows that in the comparison between tightening program from the tightening controller and tightening definition in the configuration, there is a difference in the docu step listing. As already described above (no docu step has been defined in the program), this is not admissible and thus interpreted as "error". As there is no docu step, no tightening step can be transferred into the configuration - this should be corrected in the tightening program.

After closing of the comparative detail view and the automated data entry window, the main window of the configuration software with opened line editor will be shown again:

Figure 6-10 Screenshot Line editor after cell information read-in

Now, the line editor shows all tightening channels and tightening applications as they have been transferred from the tightening system. The red arrows in front of the tightening channels (or the cell) indicate that it has not yet been allocated to a station.

The station has now been completely created – the next step is the creation of a tightening station and assignment of the tightening channels to the tightening station (or to the tightening spindles).

6.2.2 Creating a Station and Allocating the Spindles

A station can only be created in the context of a line; therefore, the line is created first. This is done via the context menu in the line area (central column in the line editor):

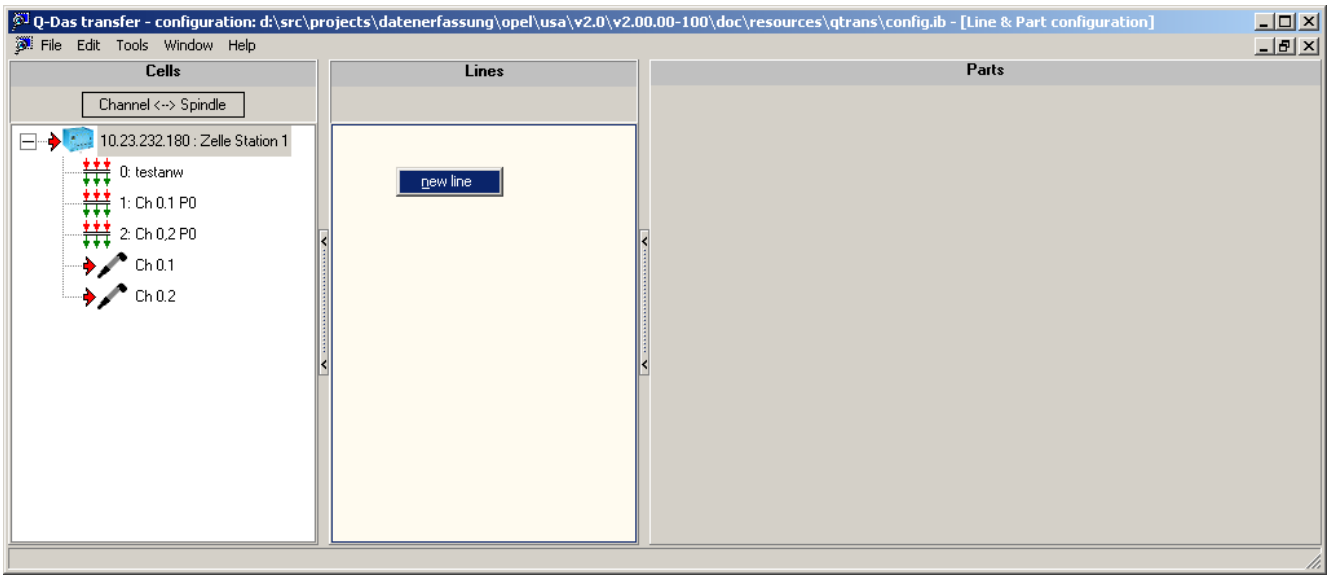


Figure 6-11 Screenshot Creation of a new line

After the new line has been created, line number and line name can be determined (these are catalog fields, i.e. you must first of all select an entry from the list, see area ①):

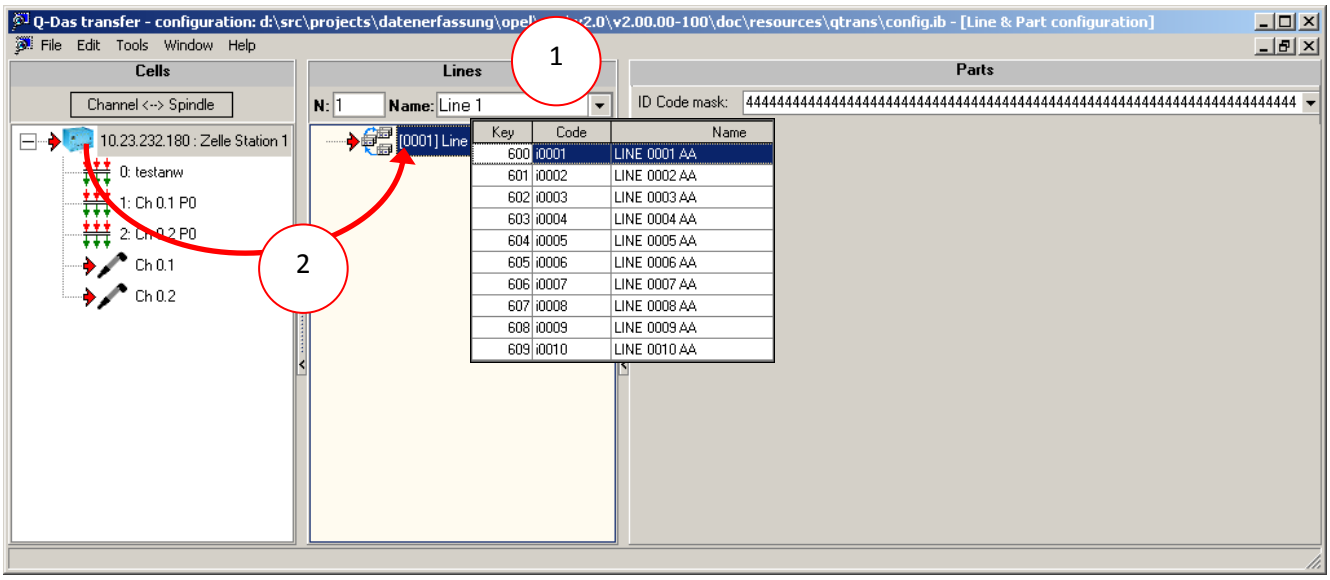


Figure 6-12 Screenshot Determining line number and name from the catalog

In order to add a new station, you must now drag a tightening controller (or a tightening cell) to the line by means of drag&drop (see arrow ② in the preceding screenshot). The result will then look as follows:

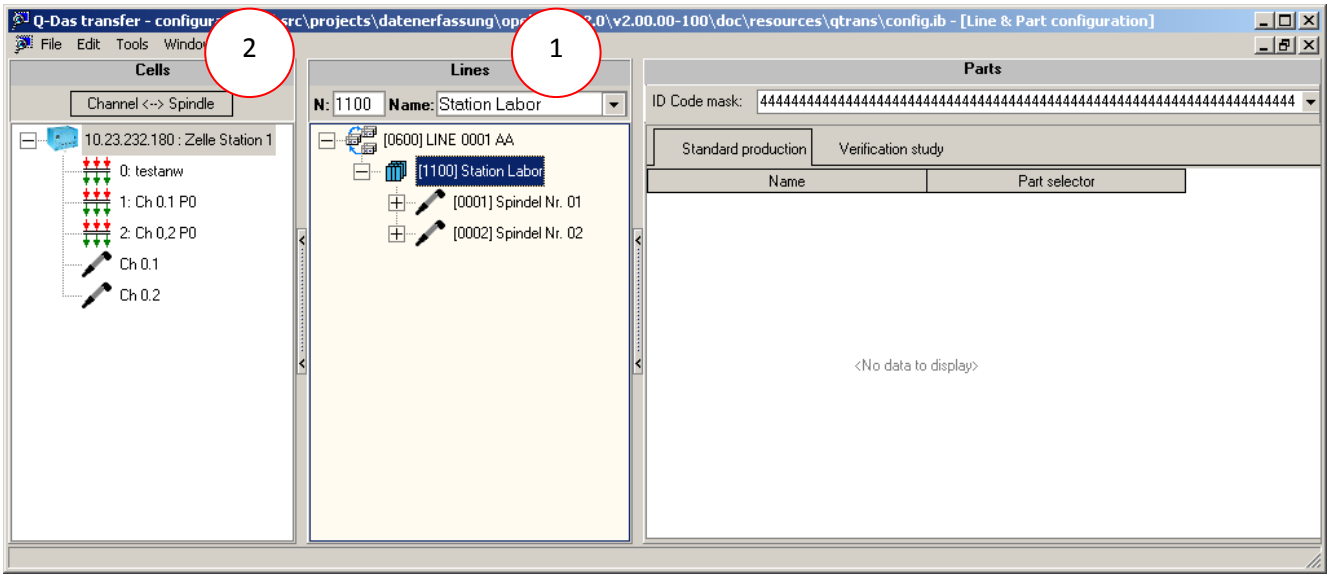


Figure 6-13 Screenshot Line editor after tightening cell assignment

You can see that all red arrows have disappeared (all tightening channels have been allocated to tightening spindles). A station has been created automatically (number and name can again be selected via a catalog, see drop-down entry field in area ① in the screenshot above) and the spindles have been inserted accordingly.

Note: In case of drag&drop operations selecting new elements, the first unused entries from the corresponding catalogs will always be used for all catalog fields!

In order to check the assignment between tightening channels and tightening spindles, the "Channel ⇔ Spindle" button can be activated (area ② in the preceding screenshot). Afterwards, the display between the

tightening cell and the line will always be synchronized automatically: If, e.g., you click on spindle no. 2, tightening channel Ch 0.1 will also be marked in the area of the cell in the tree.

If the spindle assignment is to be changed (e. g. the order), a spindle can be deleted by calling the context menu for the spindle (right click). This spindle will then be free again for the assignment to a station. The following screenshot shows the state after deletion of spindle 1:

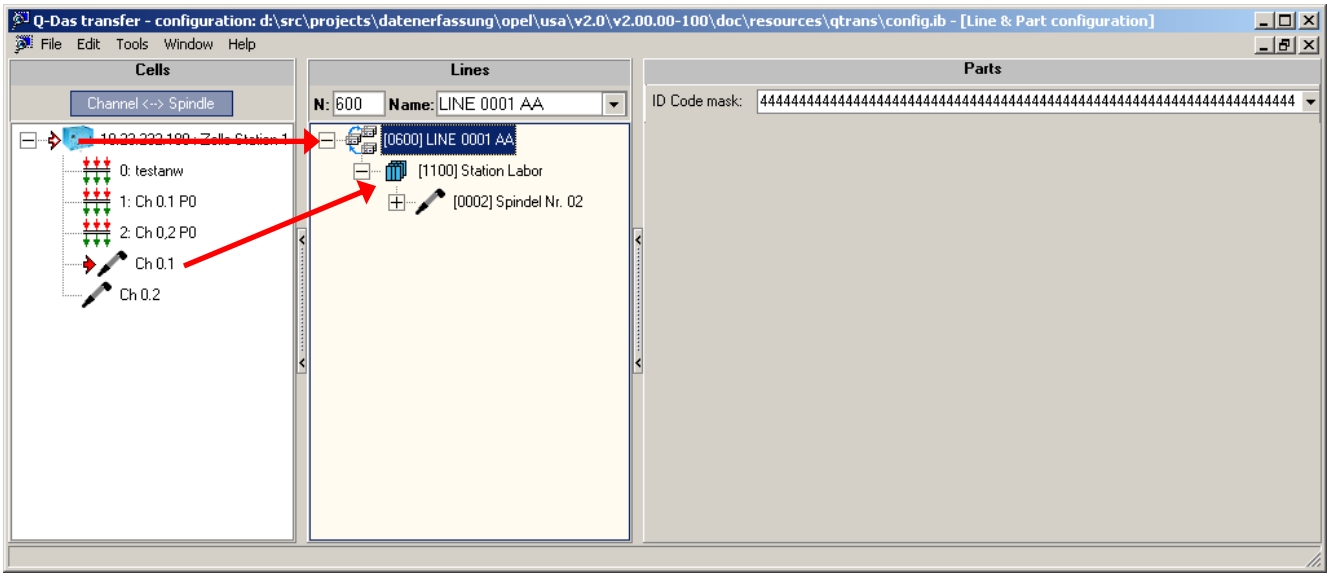


Figure 6-14 Screenshot after deletion of spindle 1

Here, two operations are possible now (see arrows in the preceding screenshot):

- Drag&drop of the tightening cell to the line: This would create a new station and enter the tightening channel that has not been allocated yet as new spindle of the station.
- Drag&drop of channel Ch 0.1 to the station: This would create a new tightening spindle in the existing station – effectively, this would change the order of the spindles as compared to the original configuration (as with drag&drop, new elements are added "at the end" of the station and/or the spindle list).

Now, the station has been created completely and all tightening channels have been allocated to the tightening spindles. The next step is the creation of parts (part types) and the definition and/or assignment of the tightening positions.

6.2.3 Creation of Part Types and Tightening Position Assignment

The creation of new parts for a station (exact part types) is either realized by calling the context menu in the parts area and selecting the "add new part" entry or automatically by means of drag&drop of a tightening program or tightening application to the parts area.

The following screenshot shows the assignment of a tightening application (as this is the fastest way for the creation of a part and at the same time, tightening positions for the individual application programs are created automatically). In order to open the application display, the station has to be selected (click on① using the mouse); consequently, the window with the list of tightening applications highlighted in yellow will be opened (②). There, you must now selected (click on) the desired application and drag it to the parts area (③) by means of drag&drop.

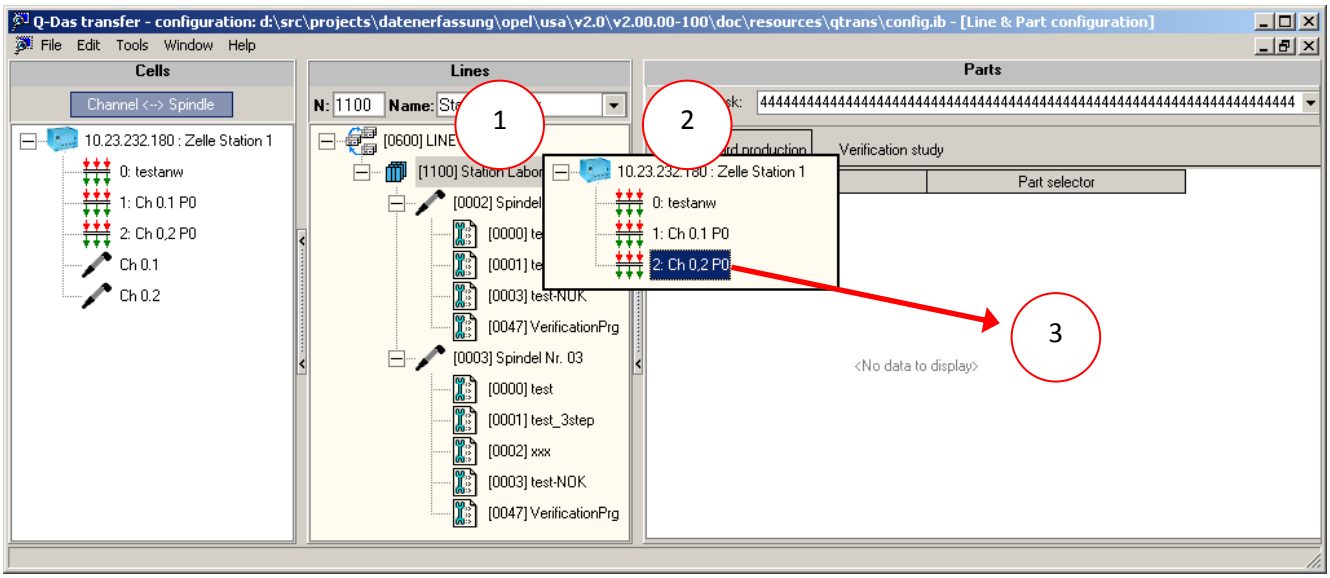


Figure 6-15 Screenshot Creating a part from an application

The result shows the following screenshot:

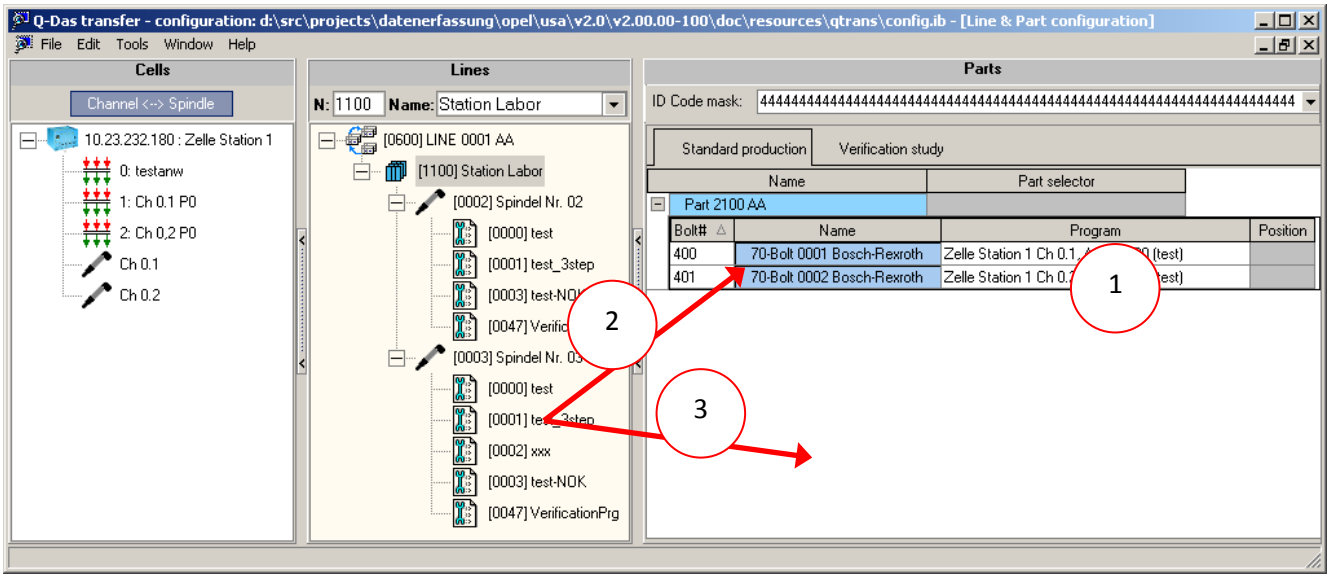


Figure 6-16 Screenshot Part after drag&drop operation

In the parts area (① in the preceding screenshot), a new part type ("Part 2100 AA") has been created comprising two tightening positions (400 and 401). The tightening positions have been transferred from the application definition as have the program numbers.

In order to add more tightening positions, the following operations can be carried out (see preceding screenshot):

- Drag&drop of a tightening program to an already existing part (operation ② in the preceding screenshot): Adds a new tightening position to the part.
- Drag&drop of a tightening program to the free area (operation ③ in the preceding screenshot): Creates a new part type and adds the tightening program as new tightening position.

Note: Both operations are also possible for applications!

6.3 Type Selection or Position Specification via ID Code

For applications in which one tightening spindle processes several tightening positions or several part types have to be differentiated, QTrans offers different possibilities for providing for clear tightening position assignments (and/or part type assignments) (see also chapter 4.2):

1. Solely using channel number, program number and application number
2. Moreover using information from the ID code

Selection of part type and/or tightening position using the information from the ID code is always reasonable if the number of program numbers and/or application numbers (max. 100 programs or 48 applications are possible) runs short, many tightening positions are tightened using the same tightening programs (the configuration work for the assignment is then less as is the administration work in case of changes in the tightening program using the BS350) or different part types have to be generated, which are, however, not differentiated by the tightening programs.

The ID code information is edited in the configuration editor. In the line editor (menu Edit → Line), the ID code processing (which part of the ID code is used for which purposes?) for the station can be defined and then, the selection criterion can be specified for the individual part types and/or tightening positions. The following screenshot shows an example:

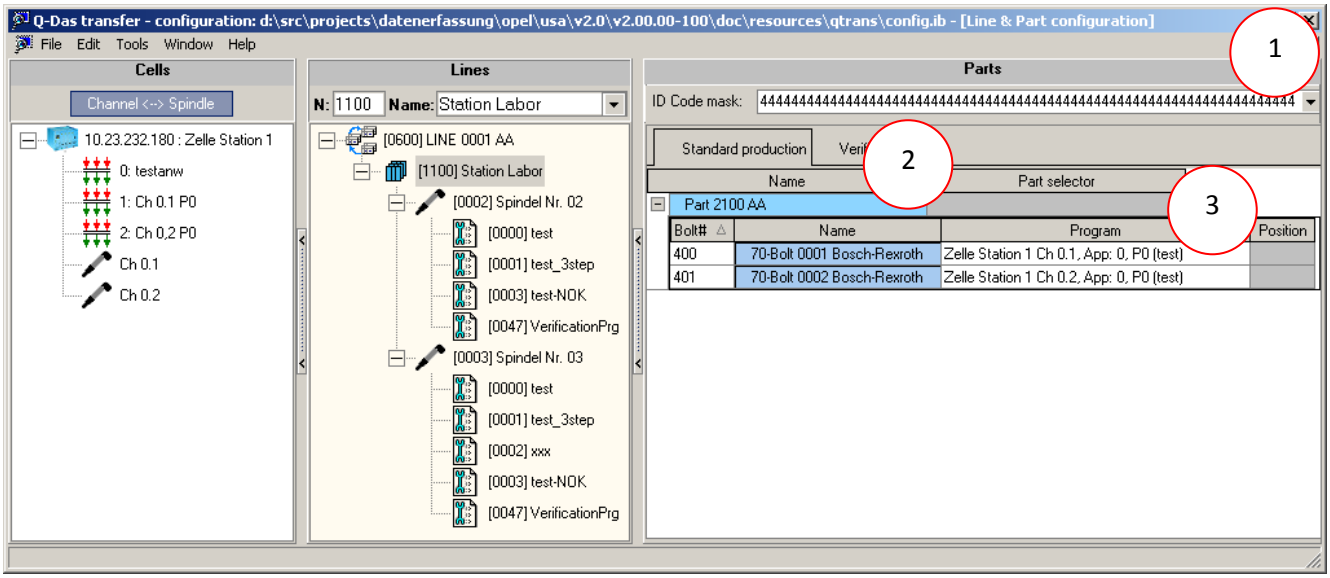


Figure 6-17 Screenshot Line editor with ID code masking

You can see the following operating elements:

- ① ID code mask for the station: It is defined here which information is taken from which location (and/or via which mechanism) of the ID code (for more information see below).
- ② Entry field for the selection criterion for a part type ("Part selector"). If it has e.g. been defined in the ID code mask that a part is selected by means of a 3-digit code, the code allocated to this part type will be entered here (e. g. code "X12" will then identify part type "Part 2100 AA").
- ③ Entry field for the selection criterion Tightening position ("Position"). If it has e.g. been defined in the ID code mask that the tightening position is positioned by means of a 2-digit code, the code allocated to this tightening position will be entered here (e. g. "01" for position 1).

For processing the ID code mask, another editor is available that is called by extending the drop-down list in the entry field of the ID code mask (screenshot above, area ①) (see the following screenshot):

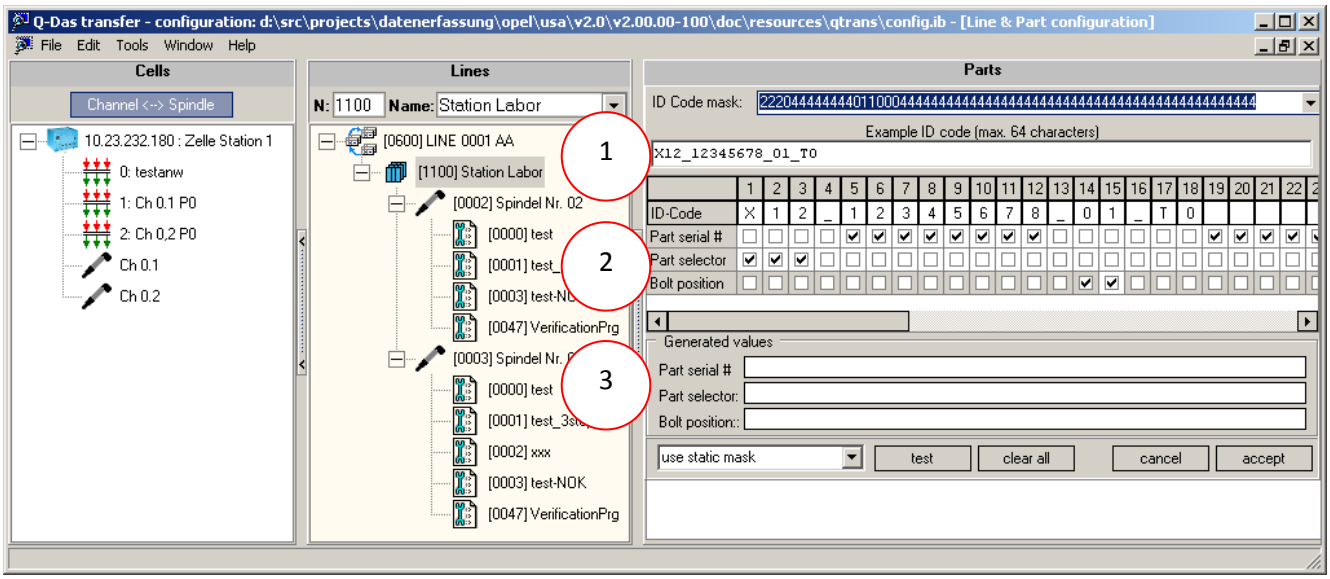


Figure 6-18 Screenshot Editor for ID code mask

The editor has three lines with checkboxes for the simple mask assignment (area ② in the preceding screenshot) for the part serial number ("Part#"), the part type selection ("Part selector") and the tightening position ("Bolt position"). If one of the checkboxes is ticked, the sign from the ID code transmitted by the tightening controller is accepted accordingly.

In order to provide for easier processing and examination of the mask definition, a sample ID code can be entered in the entry field ① and masked by clicking on the "Test" button (in area ③). The masking results are then displayed in the text fields in area 3 as can be seen in the following screenshot:

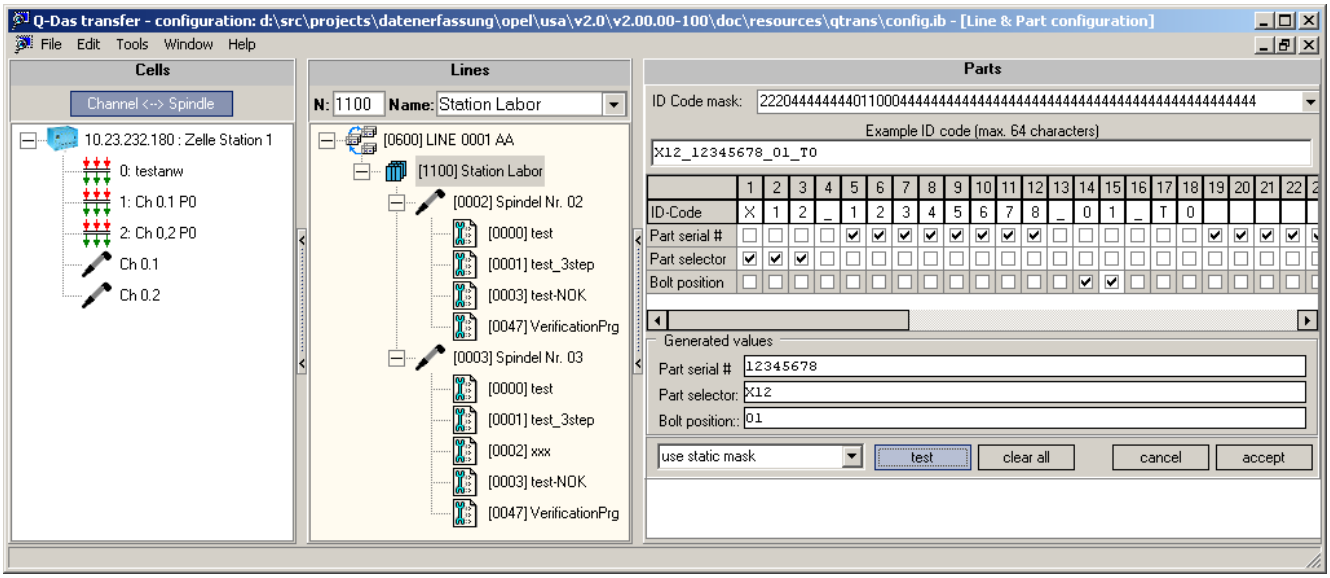


Figure 6-19 Screenshot Test for ID code masking

Pressing the "Accept" button accepts the settings and closes the editor.

You are now shown the following screen:

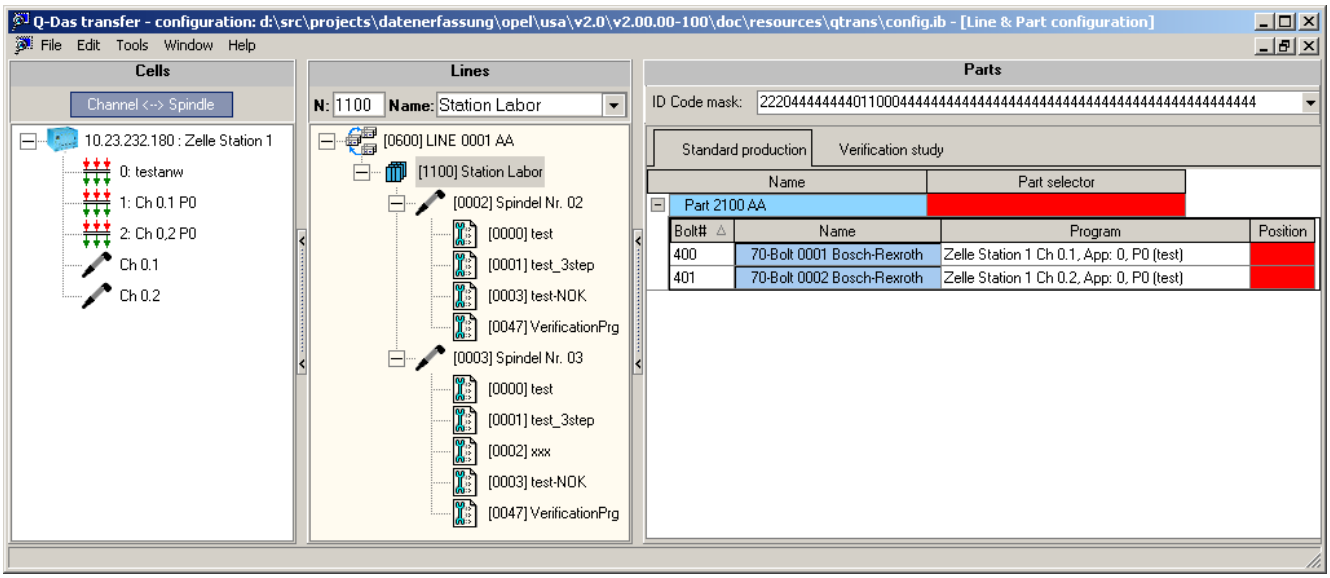


Figure 6-20 Screenshot ID code assignment with errors

The entry fields for the part type and tightening position selection are highlighted in red. This indicates an entry error for the fields concerned – this is correct as QTrans now expects a three-digit code for the part selection and a two-digit code for the position selection. If no correct codes are entered in the configuration, the tightening results cannot be allocated and no result data for the part concerned or the tightening position will be generated!

This can be corrected by entering the corresponding codes:

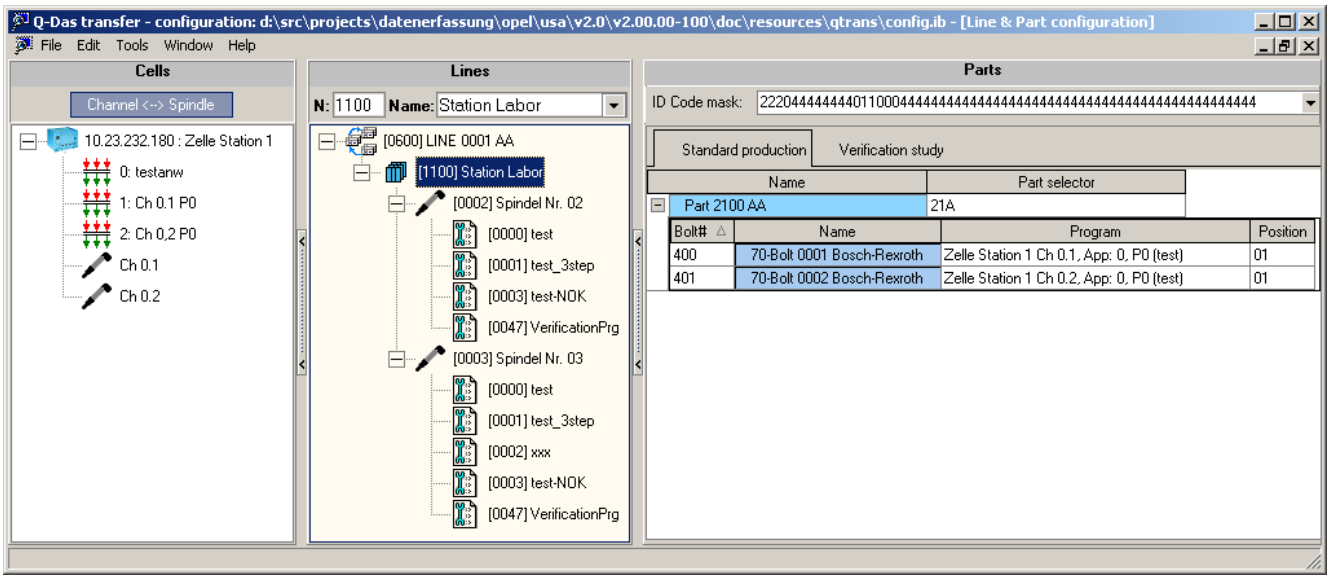


Figure 6-21 Screenshot Corrected ID code assignment

Now, the codes have been allocated correctly!

Note: The selection codes are compared in the ASCII character set character by character, i.e. the number of characters and the writing (capital/small letters) must be exactly the same. If spaces are contained, they must also be entered – to special characters, the code page 1252 (Latin) applies.

Note: In tightening applications, the tightening system transmits one joint ID code - thus, only one joint position code can be entered in the editor for the application (the editor will automatically transmit this code for all tightening positions of the application).

Note: No selection codes (0 characters entered) will be displayed with gray background color of the entry fields.

6.4 Processing K Field Values

K fields are processed in the configuration editor in the K field editor. The latter is called from the configuration editor main menu via Edit → K-Fields and displayed as in the following screenshot (in the tree in the left area, one line is selected):

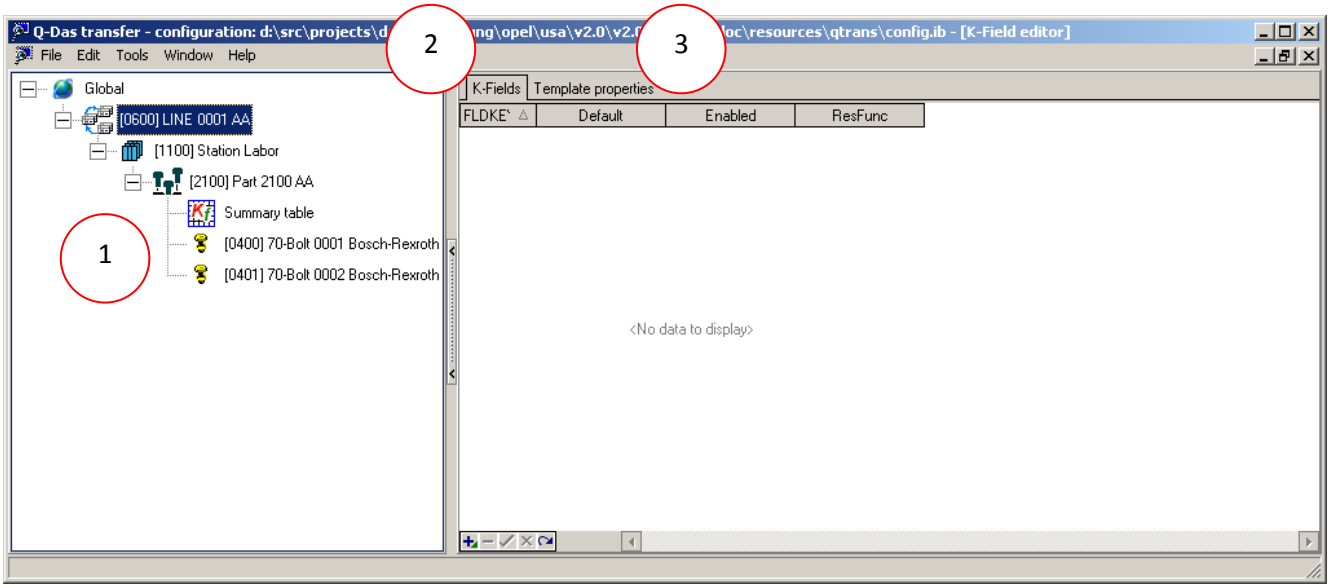


Figure 6-22 Screenshot K field editor (empty)

In the left area ①, the editor shows a structured tree view of the entire system configuration from the global level to the tightening position level. For each level, a processing window is displayed in the right area, normally comprising two index cards for the processing of the K fields (②) and the processing of the (optional) template parameters (③). For processing the global level and the "Summary table", another editor is displayed (see below).

In order to determine a new value for a K field, you should proceed as follows:

1. Decide on which available level the K field value is to be determined (line, station, part, tightening position or characteristic). In QTrans, values are "inherited", i.e. if a K field value is determined on the line level, it will also apply to station, part, tightening position, etc. As the values can, however, be overwritten on every (subordinate) level, you can also define exceptions (e. g.: A value is determined for the line, which is to apply to all parts of the line but for one). It would then be reasonable to enter the general value on the line level and to overwrite the exception for the special part.
2. Enter a new value: A new value can be created by calling the context menu and selecting the "add new record" in the editor window (right click in area ②).

The following screenshot shows an example:

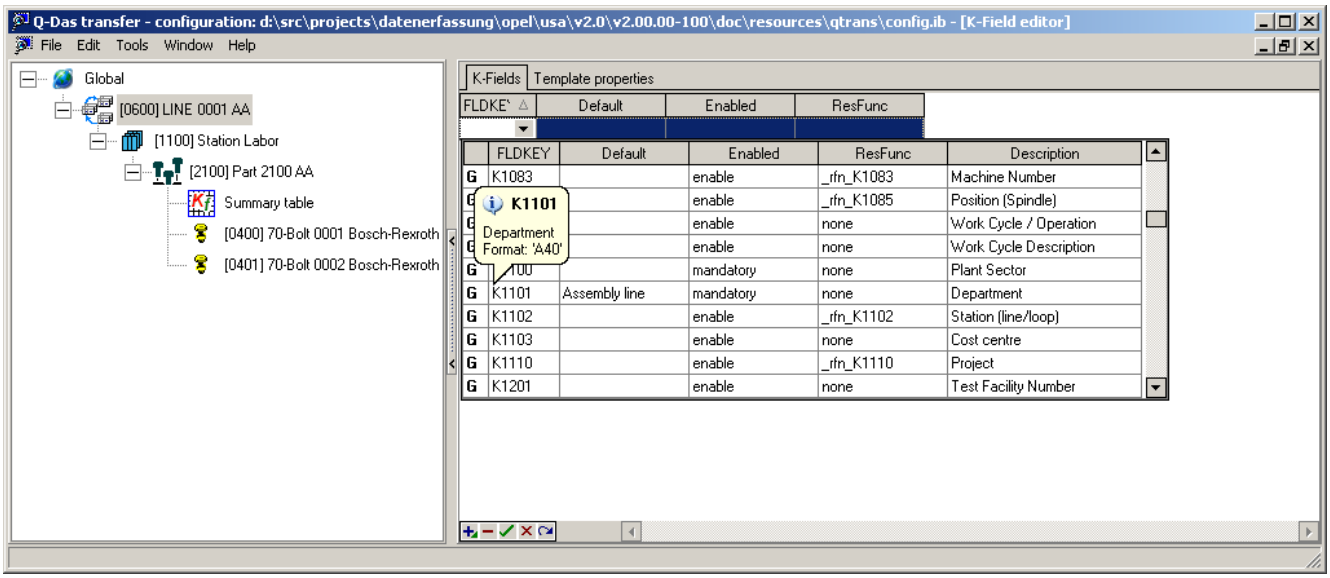


Figure 6-23 Screenshot New K field value

You will then be shown a selection list of the available K fields (on the tightening position level, no fields of the part level are available) with additional properties like name, description and already existing default values (e. g. K1101 here has a global default of "Assembly line"). The first column shows on which level the value has been defined; in this example, everything has been determined on the "G" level = Global.

By selecting list entries, you can now accept a K field for processing the value. In the following screenshot, the K fields K1101 (department) and K1110 (project) have been selected as example:

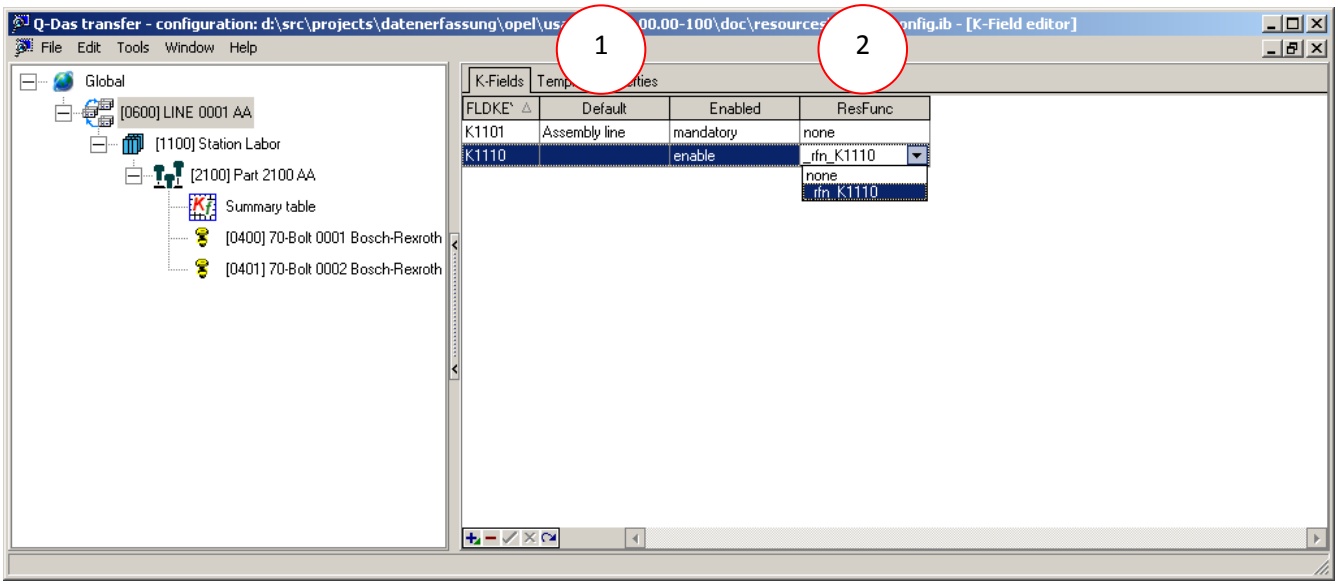


Figure 6-24 Screenshot Editing the K field value

The default K field value can be changed by editing the field value in the "Default" column ①. Here, it is important to understand that this is really a default value, i.e. this value is only used if no other data is available for this K field. Whether and how other data for this field is generated is determined by means of the "ResFunc" column ② .

As all parameters of the superior level are accepted when a new K field is inserted into the editor, the determinations for the "ResFunc" column are basically accepted there, as well. If a K field value is not only to

be accepted as Default but also as "Override" (i.e. as determined value), "none" has to be set as entry in the "ResFunc" column. Consequently, QTrans will not generate an automatically calculated value but always use the default value (that has been entered in the "Default" column).

After the processing has been completed, everything should look as follows:

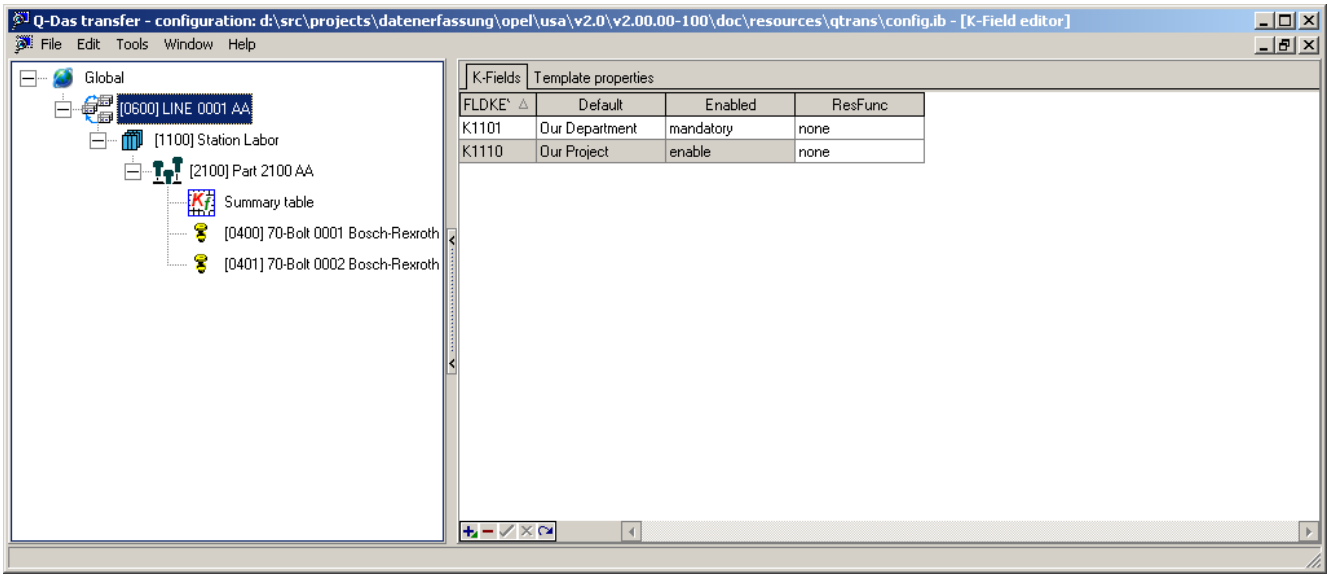


Figure 6-25 Processing K field processing completed

All K fields are enabled ("Enabled" column), the automatic calculation by QTrans is deactivated ("ResFunc" is "none") and all values have been entered according to the specifications ("Default" column).

If now, individual values are overwritten on a lower level (as described above), this can be done as follows (e. g. changing K1110 (project) on part level):

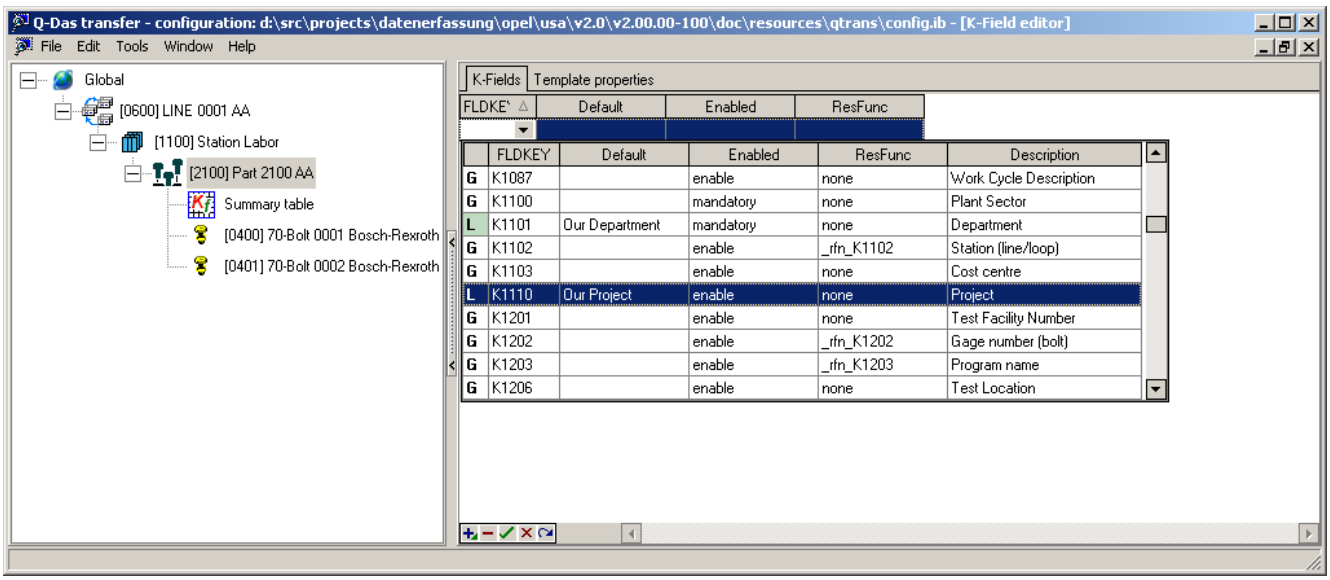


Figure 6-26 Screenshot Overwriting K field value on a lower level

The K1110 K field is again inserted in the editor (this time on the part level, "Part 2100 AA"). You can already see in the K field selection that the first column for the fields defined before (K1101 and K1110) now shows an "L" highlighted in green – an indication that this field value has been re-defined on the line level ("Override"). After acceptance of the value, it can be further processed as described above.

If K field values are to be processed on the characteristic level or if you want to see the complete list of K fields for all characteristics, the "Summary Table" entry can be selected on the left side in the tree. Then, the following editor will be shown:

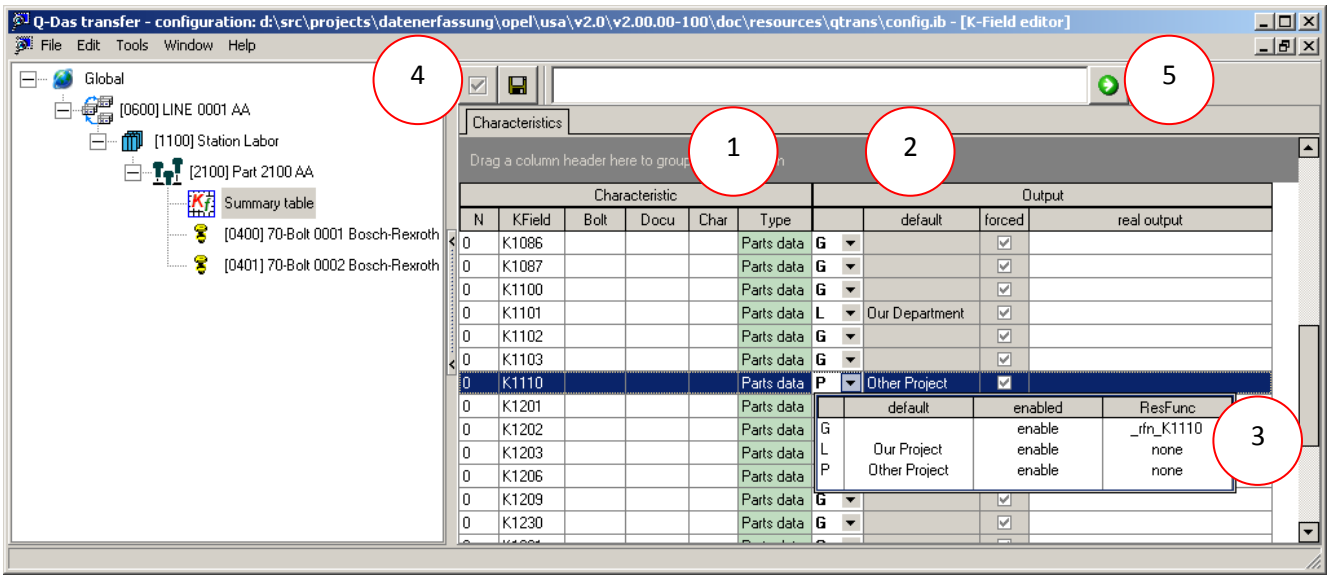


Figure 6-27 Screenshot K field table

In the editor area (① and ②), all K fields of all characteristics are listed. In area ① (descriptive data), the characteristic number (column "N", for Part-related characteristics "0" is used), the K field number, the related tightening position, the related tightening step ("Docu") and the characteristic type (column "Char", t. B. A for "Angle") as well as the K field type (column "Type") are shown for each K field. The right area ② shows information about the contents (K field values) of the K fields. The first column shows where in the configuration the K field value has been defined (by pressing the drop-down area, the hierarchy of the definition is displayed, see ③), the Default column shows the default value (or the Override value, see above), the "forced" column shows whether the value has been overwritten on characteristic level (gray = from superior level or calculated automatically, with checkbox ticked: default of the characteristic level is used, not ticked: K field is not generated in data output). The last column shows information that has been generated in the test run (test run can be called using button ⑤, see QTrans V2.0 Reference manual).

If, for example, you want to make an adjustment to the K field of a characteristic, you have to proceed as follows:

- Selection of the K field. For this purpose, the filter and grouping functions of the table can be used, e.g. group by tightening position first, then by characteristic number (drag&drop of the "Bolt" column header into the grouping area, then drag&drop of the "N" column header into the grouping area).
- Ticking of the checkbox in the "force" column
- Entry of the new value in the default column.

The result will then look as follows:

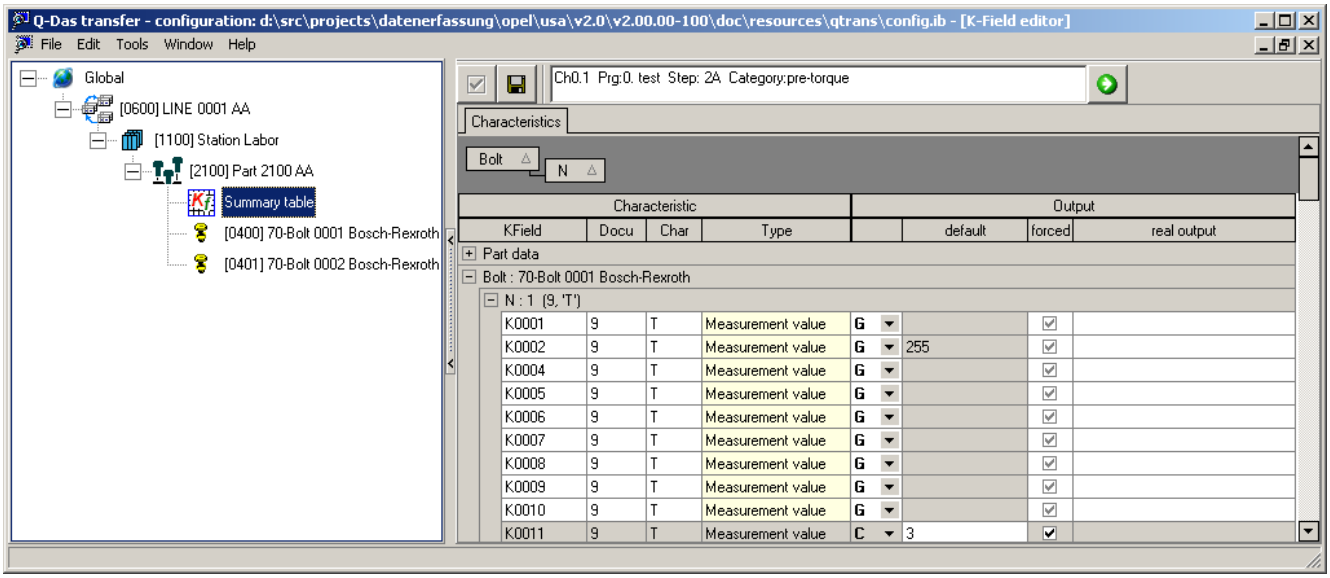

Q-Das transfer - configuration: d:\src\projects\datenerfassung\opel\usa\v2.0\v2.00.00-100\doc\resources\qtrans\config.ib - [K-Field editor]
File Edit Tools Window Help
Global
[0600] LINE 0001 AA
[1100] Station Labor
[2100] Part 2100 AA
Summary table
[0400] 70-Bolt 0001 Bosch-Rexroth
[0401] 70-Bolt 0002 Bosch-Rexroth
Ch0.1 Prg:0. test Step: 2A Category:pre-torque
Characteristics
Bolt
N
Characteristic
Output
KField Docu Char Type default forced real output
Part data
Bolt : 70-Bolt 0001 Bosch-Rexroth
N : 1 (9, 'T')
K0001 9 T Measurement value G
K0002 9 T Measurement value G 255
K0004 9 T Measurement value G
K0005 9 T Measurement value G
K0006 9 T Measurement value G
K0007 9 T Measurement value G
K0008 9 T Measurement value G
K0009 9 T Measurement value G
K0010 9 T Measurement value G
K0011 9 T Measurement value C 3

Figure 6-28 Screenshot K field table with characteristic change

Here, the value of the K0011 K field has been changed (selection via a catalog). The column displaying the entry's hierarchy level now shows a "C", an indication that the value has now been determined on the characteristic level ("C" = Characteristic).

In order to change several K field values simultaneously, the K field table offers an additional option (see following screenshot): By applying filters (① shows the active filter), the quantity to be changed is selected and the first entry is then edited manually (as described above). Then, the first entry is copied to all other fields by clicking on the button (green pushbutton ②).

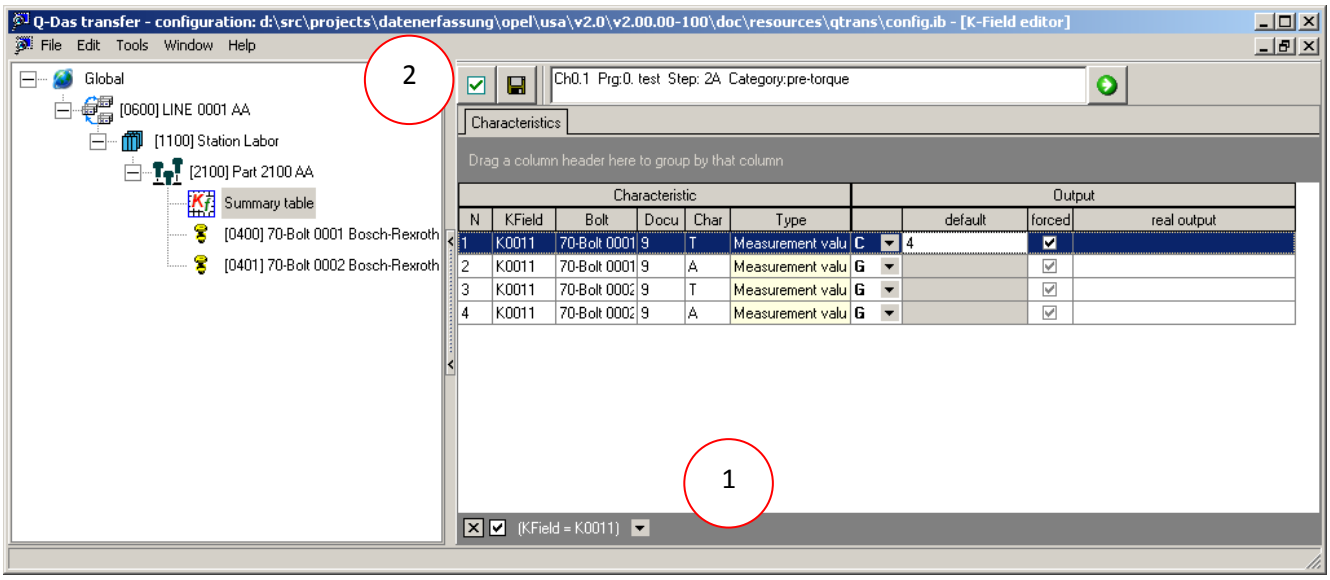

Q-Das transfer - configuration: d:\src\projects\datenerfassung\opel\usa\v2.0\v2.00.00-100\doc\resources\qtrans\config.ib - [K-Field editor]
File Edit Tools Window Help
2
Global
[0600] LINE 0001 AA
[1100] Station Labor
[2100] Part 2100 AA
Summary table
[0400] 70-Bolt 0001 Bosch-Rexroth
[0401] 70-Bolt 0002 Bosch-Rexroth
Ch0.1 Prg:0. test Step: 2A Category:pre-torque
Characteristics
Drag a column header here to group by that column
Characteristic
Output
N KField Bolt Docu Char Type default forced real output
1 K0011 70-Bolt 0001 9 T Measurement valu C 4
2 K0011 70-Bolt 0001 9 A Measurement valu G
3 K0011 70-Bolt 0002 9 T Measurement valu G
4 K0011 70-Bolt 0002 9 A Measurement valu G
1
(KField = K0011)

Figure 6-29 Screenshot K field table multiple assignment

6.5 Checking the K Field Values using Nutrunner Test Data

The K field table described above for editing K field values on characteristic level can also be used for checking the generated data. There, all the data is basically shown in the same form as it will later be generated by QTrans and saved in the corresponding Q-Das files.

For calling the test function, button ① in the K field table must be called; after that, the file selection dialog ② for selecting a test file will be displayed (see following screenshot).

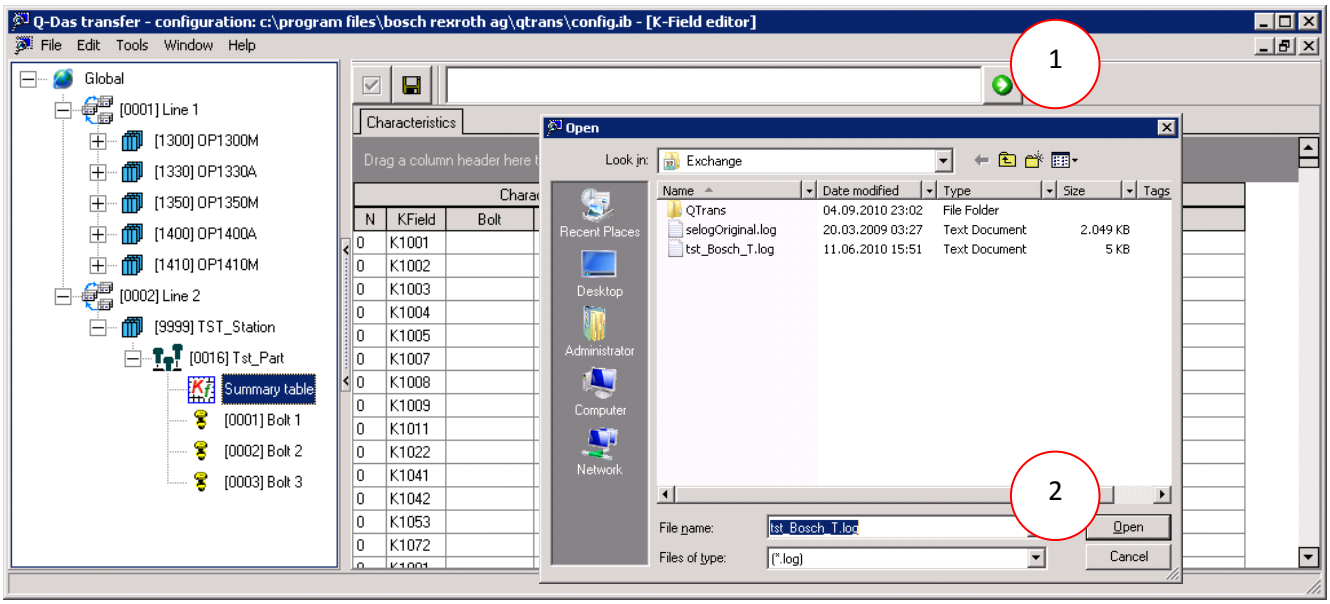


Figure 6-30 Screenshot K field table test run

After selection of a suitable result file (FTP dataset), the data dialog for selection of the test data will then be displayed:

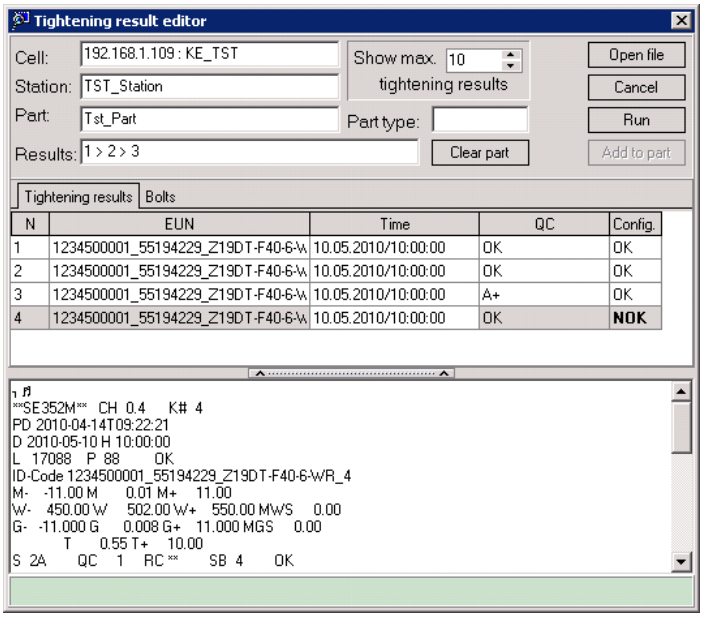


Figure 6-31 Screenshot Dialog for test data selection

Here, the individual datasets contained in the file are listed in the central area – by pressing the "Add to part" button, they can be added to the test dataset. By pressing the Run button, a complete Q-Das dataset is generated, the dialog is closed and displayed in the K field table as follows:

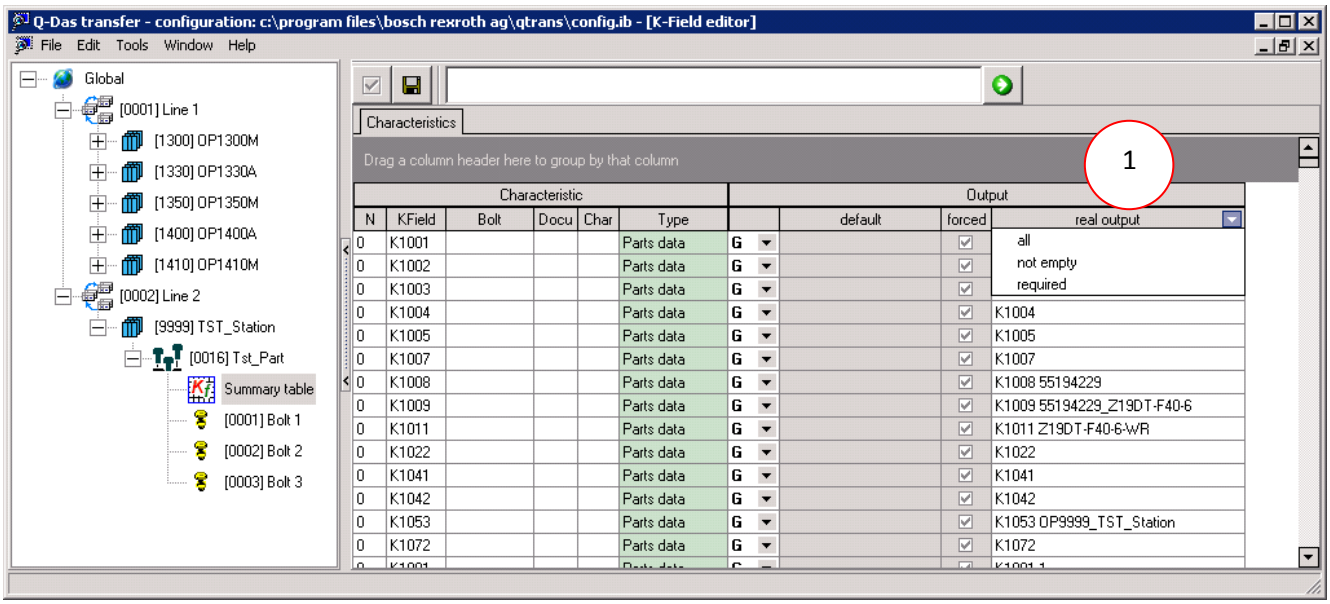

Q-Das transfer - configuration: c:\program files\bosch rexroth ag\qtrans\config.ib - [K-Field editor]
File Edit Tools Window Help
Global
[0001] Line 1
[1300] OP1300M
[1330] OP1330A
[1350] OP1350M
[1400] OP1400A
[1410] OP1410M
[0002] Line 2
[9999] TST_Station
[0016] Tst_Part
Summary table
[0001] Bolt 1
[0002] Bolt 2
[0003] Bolt 3
Characteristics
Drag a column header here to group by that column
1
Characteristic
Output
N KField Bolt Docu Char Type default forced real output
all
not empty
required
0 K1001 Parts data G
0 K1002 Parts data G
0 K1003 Parts data G
0 K1004 Parts data G K1004
0 K1005 Parts data G K1005
0 K1007 Parts data G K1007
0 K1008 Parts data G K1008 55194229
0 K1009 Parts data G K1009 55194229_Z19DT-F40-6
0 K1011 Parts data G K1011 Z19DT-F40-6-WR
0 K1022 Parts data G K1022
0 K1041 Parts data G K1041
0 K1042 Parts data G K1042
0 K1053 Parts data G K1053 OP9999_TST_Station
0 K1072 Parts data G K1072

Figure 6-32 Screenshot K field table test run result

The generated K field data is displayed in column ① "real output". By means of the table's standard functions (filter, sort, group), the generated data can be further examined (in the screenshot above, the column filter is, e.g., displayed at the "real output" column).

7 Monitoring and Diagnosis

7.1 QTrans Station Overview and Reports

Apart from the station state, the station overview in the QTrans main window ("Operations" index card) also shows counters for the number of received and correctly processed data packages (See following screenshot).

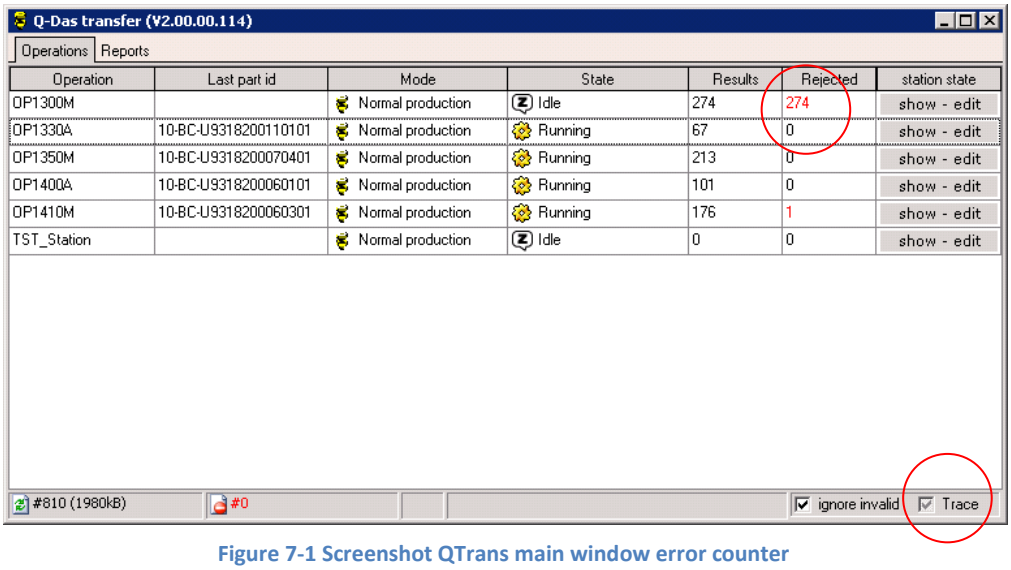


Figure 7-1 Screenshot QTrans main window error counter

If data is received that cannot be allocated, an error counter is increased and the received dataset is saved, if applicable ("Trace" checkbox). In this way, it can be easily seen whether the system configuration still contains errors. For further cause diagnosis (why has it not been possible to allocate a tightening result), the dynamic report (on the "Reports" index card) is useful – it also shows rejected tightening results and provides more details why a result is not ok.

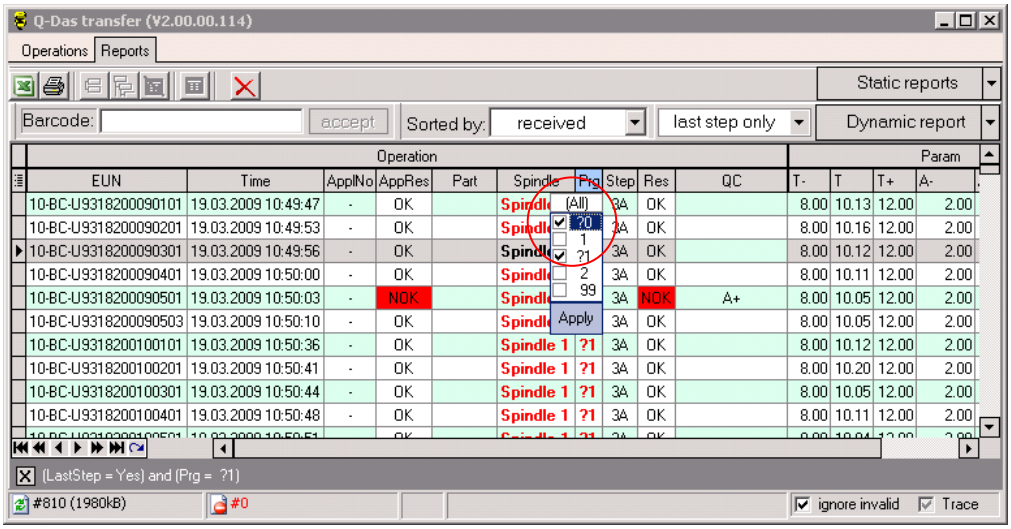


Figure 7-2 Screenshot QTrans report error analysis

By selecting the column filters (program number), it can be easily recognized that for some tightening results, the tightening program has not been allocated - QTrans has not been able to find a tightening position!

7.2 Monitoring for QBackup Data Transfer

If the automatic network transfer service has been installed (QBackup, for "push" transfer of the created Q-Das files), an icon will be shown for the logged on user (whether locally or via remote terminal services) in the Windows tray displaying more information on the state of the file transfer to the Q-Das server:

Figure 7-3 Screenshot QBackup monitor

7.3 Configuration Editor Test Run

In case of problems with the Q-Das data output, the function described in chapter 6.5 (Checking the K Field Values using Nutrunner Test Data) can be used. For this purpose, the Trace file generated by QTrans (see previous section, chapter 7.1) can be imported and examined in detail in the configuration table.

Here, you can then easily answer questions like the following:

- Why is a K field missing?
- Where does the incorrect value in the K field come from (by means of the inheritance view in the editor)?

7.4 Windows System Functions

QTrans is deeply integrated into the Windows system and uses its management functions.

7.4.1 Event Log

The QTrans software components write important information into the Windows system log (event log). The event log can be easily monitored by means of common management solutions so that malfunctions or configuration problems can be forwarded and processed.

7.4.2 Event Tracing for Windows

The QTrans software components use the Windows event tracing infrastructure for writing important information about the program process. This function can be activated via the standard Windows management applications (trace level) and in case of errors provides additional information on the error cause.